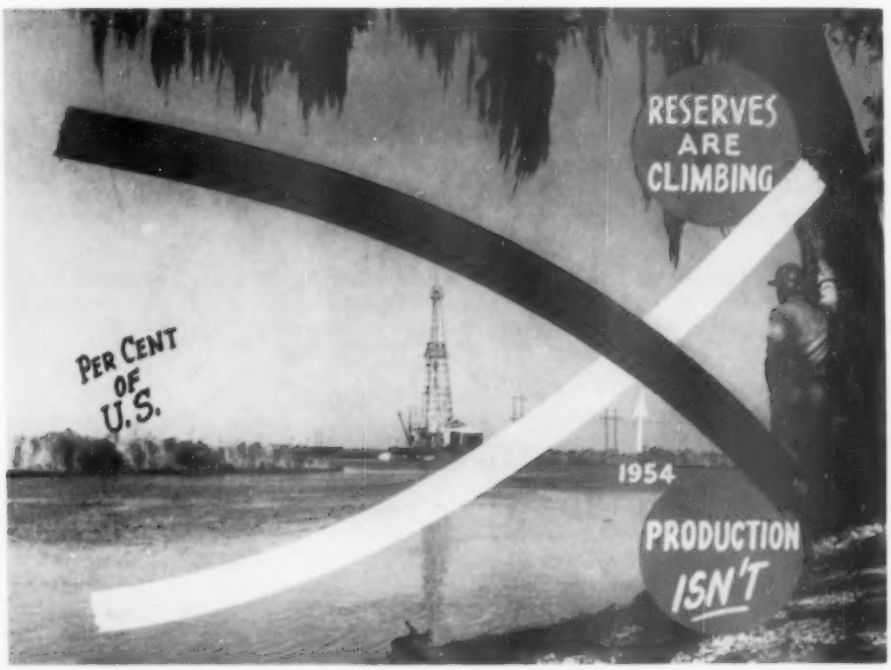
the OIL AND GAS JOURNAL

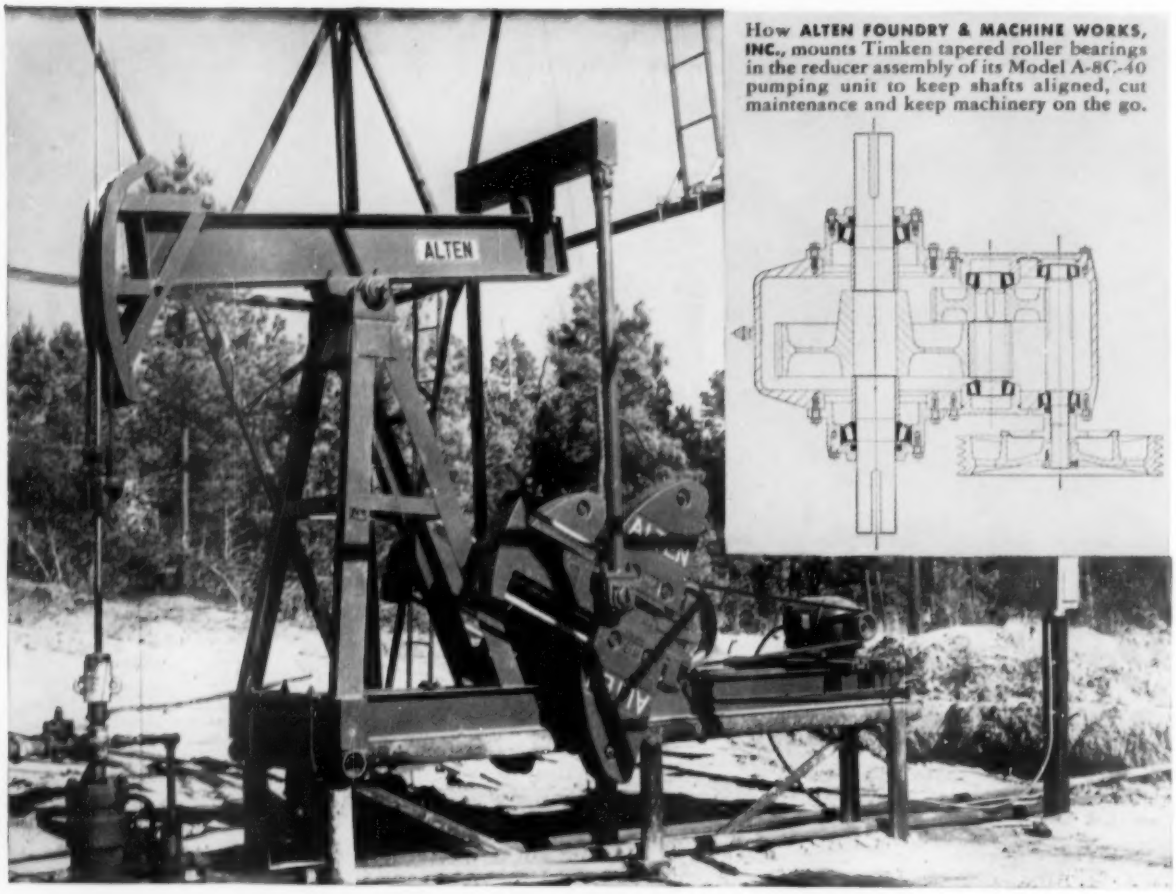
JUNE 4, 1956

Is Louisiana Producing Its Share of U. S. Oil?



. . . Some operators in the bayou country feel that they're being shortchanged. p. 58

Operate Your Cat Cracker for Maximum Yield of Catalytic Naphtha. p. 81



How **ALTEN FOUNDRY & MACHINE WORKS, INC.,** mounts Timken tapered roller bearings in the reducer assembly of its Model A-8C-40 pumping unit to keep shafts aligned, cut maintenance and keep machinery on the go.

Oil pumping unit is 'all pump—no slump' with shafts on TIMKEN® bearings

ALTEN Foundry & Machine builds pumping units like this model A-8C-40 for the rugged service of the petroleum industry. Because every part is engineered to give uninterrupted field operation, Alten units perform to full-rated capacity day in, day out—pumping oil from deep wells. With the slow speed shaft, intermediate shaft and high speed shaft of the reducer assembly mounted on 6 Timken® bearings, the pump keeps on the go with maximum efficiency. Costly shutdowns are prevented.

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TRADE-MARK REG. U. S. PAT. OFF.

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Secondary recovery in California will get a shot in the arm if the state's citizens approve the pending initiative oil-conservation measure.

Several full-scale floods, as well as pressure-maintenance projects, are planned but can't be started until a "majority rule," or "compulsory" unitization (as opponents call it), law is adopted.

Fabulous offers for state and federal leases, especially in the offshore area, are prompting a few private landowners to hold out for more cash and higher royalty.

Some oil-company representatives admit privately that the cost of good leases in southern Louisiana and other hot spots is likely to rise as result of high bidding for government acreage. "They can read," commented one spokesman.

The proposed tax increase on natural gas produced in Louisiana could discourage further industrialization there.

Public Affairs Research Council of Louisiana, Inc., says Louisiana already has a higher tax on natural gas than other major producing states. A proposal introduced in the Legislature would boost the gas-gathering tax from the present 1 cent per M.c.f. to 3.5 cents.

The research council claims this would raise the state's cut on natural gas to about 38 per cent of field price.

Wherever 100-plus octane gasoline is being considered today, alkylate is playing an important part. Much alkylate is now going into conventional premium gasoline, but it is a "must" for any of the super-premium grades under production or consideration.

Many refiners are adding alkylation capacity for avgas and motor fuel. But one in particular, Canadian Petrofina, Ltd., is blending its full alkylate production to premium gasoline in the new Montreal East refinery. When it's operating at rated capacity, the alkylate yield runs over 12 per cent of total gasoline production.

Natural-gasoline plant operators are looking at the newer processing techniques in increasing numbers.

Most seem to feel that ultimately their operations must include one or a combination of these processes: pentane isomerization, hexane and heptane isomerization and, in some instances, catalytic reforming. In addition to upgrading natural gasoline for blending, some operators are planning to tailor special stocks for petrochemical manufacture.

Politics and the public's belief that more commercial television channels are needed are keeping the Federal Communications Commission from settling the split-channel question for industrial mobile radio.

The industry wants to cut individual channels in half. The F.C.C. wants it also but has to have full-scale hearings on it. Such hearings are being delayed because of political pressure on the commission to shuffle radio channel allocations so as to get in more TV outlets.

The OIL AND GAS JOURNAL

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OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY—OPERATION

Drilling—Production

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By C. R. Bayless and F. J. Mikeska

Part 1 of a series of three articles on automatic production case histories.

Structure and Stratigraphy Play Major Roles at Citronelle **90**

By Norman S. Morrisey

Citronelle, key discovery of 1955, is blossoming into the most important oil field in southeastern United States.

Slant-Hole Drilling to Reduce Costs **92**

By Fred Norris

This 15,000-ft. Oklahoma wildcat was 962 ft. away from surface location. Liberal deviation limits helped speed penetration rates.

Elements of Field Processing: How Controllers Work **95**

By John S. Ache and John M. Campbell

Here's the theory behind automatic controls used for lease operations.

Refining—Processing

Cat Cracking for Maximum Yield of Catalytic Naphtha **81**

By R. C. Davidson, R. S. Schute, and R. B. Secor

Sacrifice of naphtha yield from the catalytic cracking unit for a few octane numbers is not only expensive but may not give as high final octane level in the pool.

Two-Stage Approach to Alkylation Efficiency **88**

By G. D. Borthick, L. V. Durland, and B. J. Pope

Detailed preventive-maintenance procedures and plant tests on the alkylation unit at Utah Oil Refining Co.'s Salt Lake City refinery provide for more efficient operation.

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By D. L. Glaser

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By M. H. Atkinson and A. H. Newberg

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By J. R. Shipley

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By C. R. F. Wickenden

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Seven Steps to Better Slides **100**

By Carl Hoot

Here's what to do to get your presentation across when using slides.

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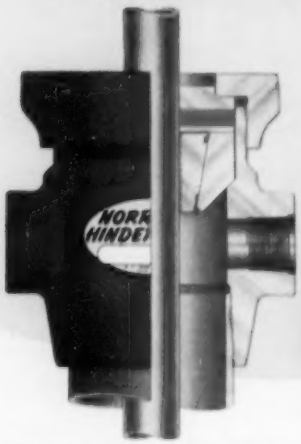

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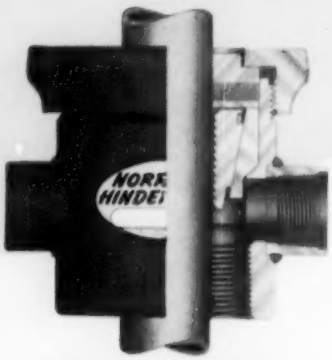
4000# Test Pressure
2000# C.W.P.



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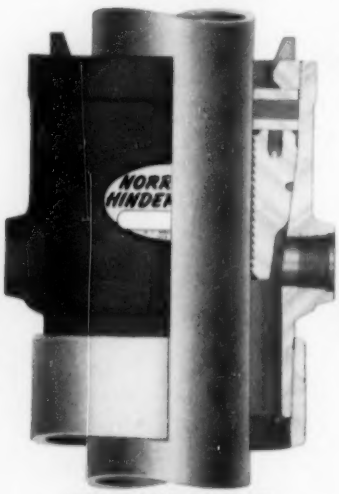

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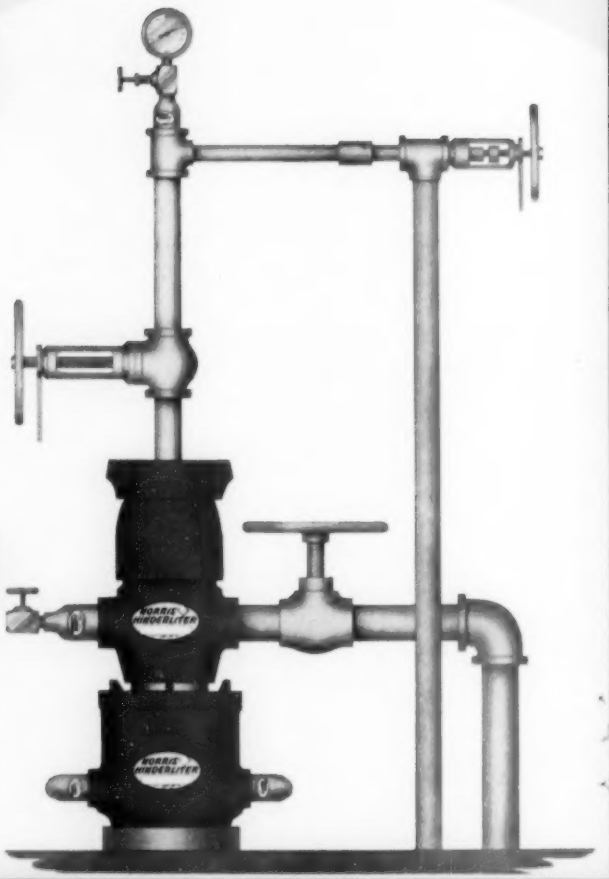

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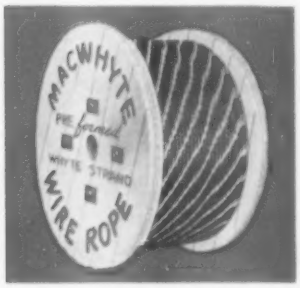

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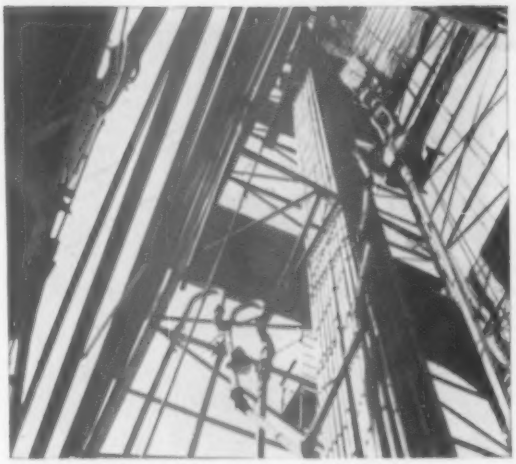

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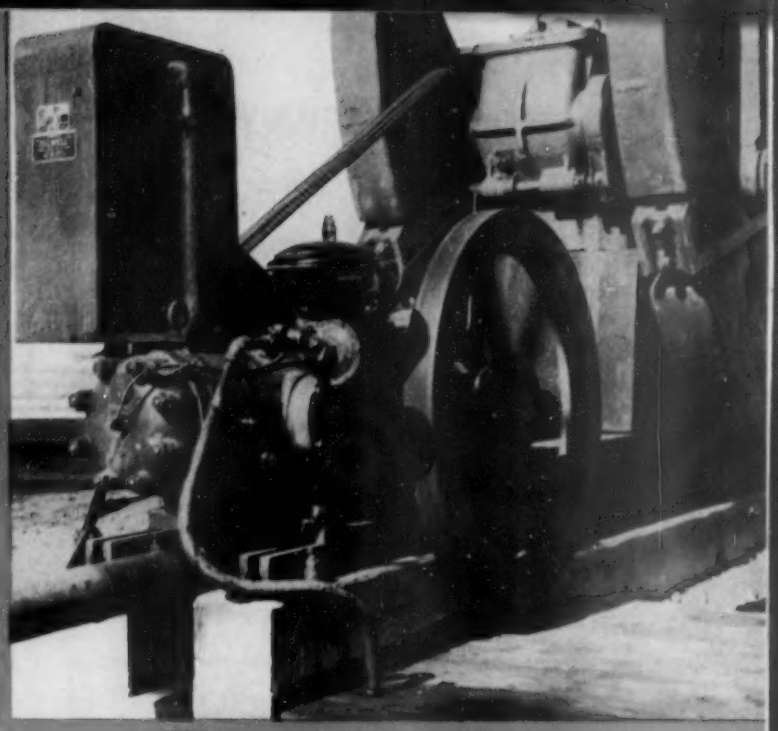

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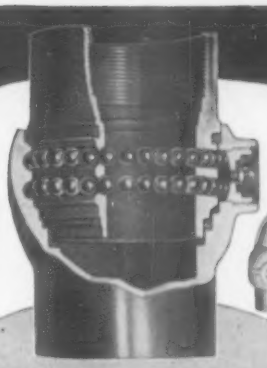

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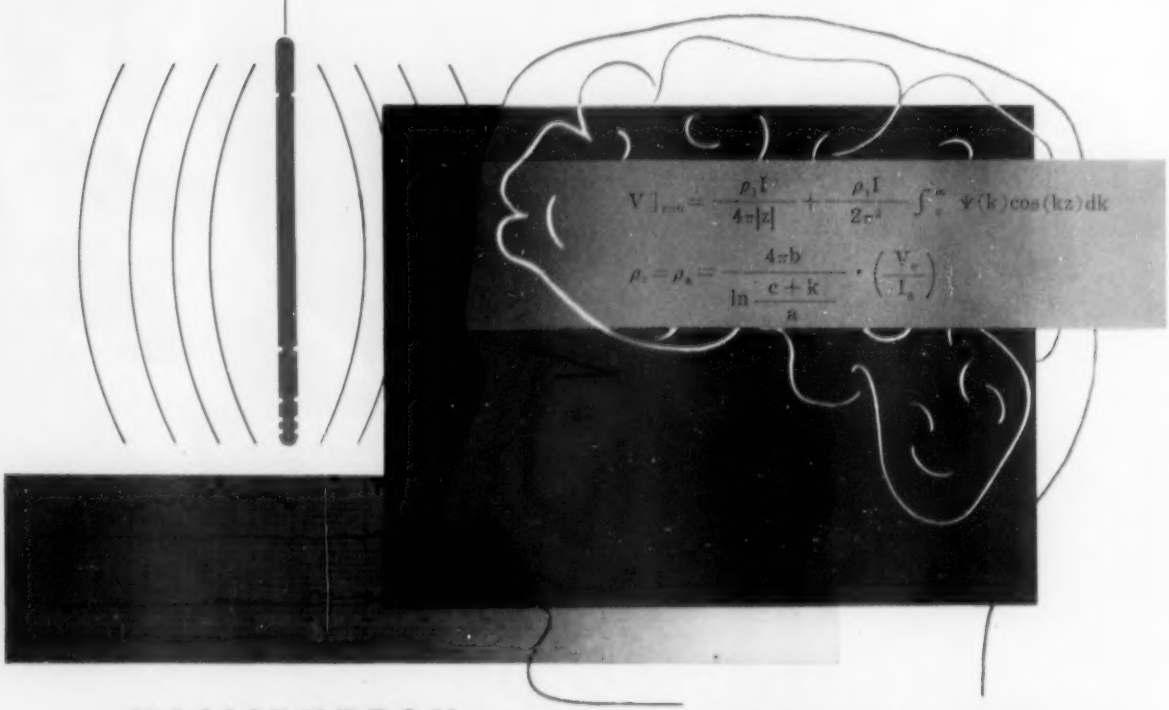

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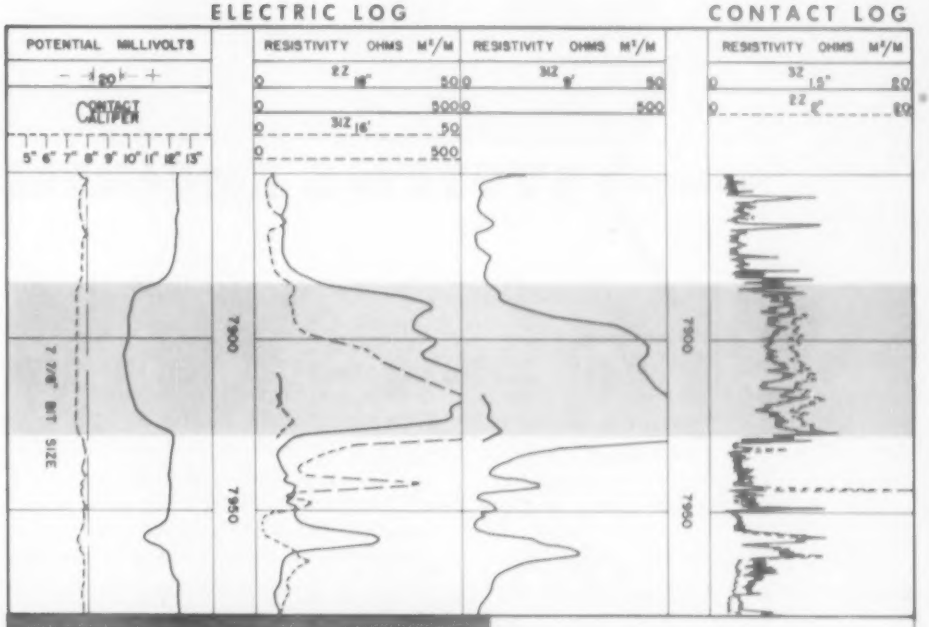

RESERVOIR EVALUATION

Morrow Sand

	From Cores	From Logs
7884-7928'		
POROSITY	15.2%	16.5%
WATER SATURATION	Not Available	25.0%
MAXIMUM MOBILE HYDROCARBONS (In situ) Bbls/Acre Ft.	Not Available	760

PRODUCTION DATA

Producing Interval 7886-7926'

Perforated with 160 shots

Initial Production 844.2 Bbls. oil/day

flowing through 25/64" choke GOR 635/1

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I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	GPE CAPACITIES
●●●	●●	●●	□●●	●●	●●●		●●	●●●	●●	●●	●●	●●●	Precision Mechanics, Optical Devices, Ceramics
●●●	●	●			●●●		●●●	●●	●	●●	●	●●●	Electrical Equipment and Components
●●●	●●	●●●	●●●		●●●		●	●●		●●●	●●	●●●	Electronics
	●●			●●●		●●●				●●●			Hydraulics, Liquids Processing, Heat Exchange
●	●		●●●		●					●			Television: Studio, Theatre, Business, Institutional, Industrial
●●●	●	●●	□●●		●●●	●●●	●●	●●		●●●	●	●●●	Instruments, Servos, Controls: Hydraulic, Pneumatic, Magnetic, Electronic
●●●	●		●●●		●●●		●			●●	●	●●●	Aircraft and Missile Guidance, Control, Simulation
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●●●	●	●●	●●●		●●			●		●			Radar, Microwave, Ultrasonics
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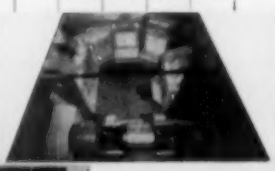
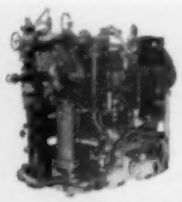
●●●			●●●	●●●	●●●	●●●				●●●		●●●	SYSTEMS ENGINEERING

Librascope Desk-Size Computer



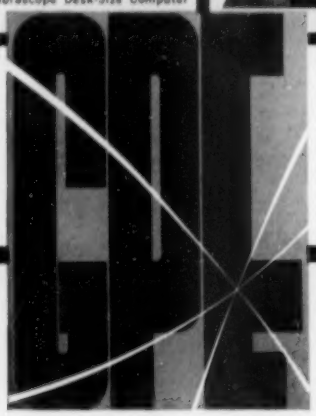
Link Aviation F-890 Jet Simulator

GPL Industrial-Institutional TV System



Griscom-Russell Shipboard Distilling Plant

Askania Electro-Jet Power Package



SYSTEMS ENGINEERING

The GPE Companies are leaders in that small, select group in American industry which is broadly qualified to develop and produce the systems needed today for defense and industry. GPE leadership accounts for some of the most advanced systems in use in business, television, aviation, marine, steel, oil, and other industrial fields.

In Systems Engineering, highly advanced capacities and resources are prerequisite. Yet, no matter how highly advanced, they are of little use if limited to a few areas. Finding optimum solutions to complex systems problems calls for *balanced competences*. And beyond that, success calls for the consistent application of such competences *at every stage* — beginning with research, and extending all the way through development, production and final testing.

No GPE company is limited by the boundaries of its own specialties. The basic GPE operating policy, GPE Coordinated Precision Technology, places at the command of each company in the group all GPE research, development and production facilities, and the skills and experience of the more than 2500 GPE technical men working in depth in the wide range of advanced capacities indicated in the chart above.

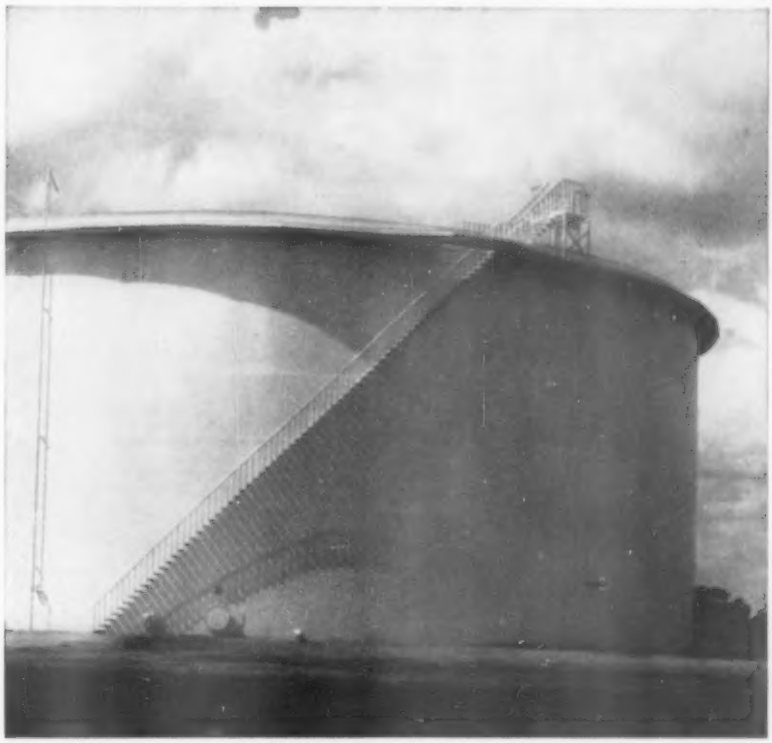
Behind each group working on a specific problem in one GPE company stands the whole group of GPE scientists, engineers and technicians with the answers — or the knowledge that will find the answers — to questions underlying and related to that problem. To the customers of GPE Companies this means that the concept and development of equipment, components and systems are not restricted or distorted by traditional allegiance to specific competences.

The five systems illustrated, while products of different GPE companies, are all examples of the consistent application of balanced competences, achieved through GPE coordination. For brochure describing GPE Coordinated Precision Technology and the work of the GPE Companies, or help on a specific problem, write: General Precision Equipment Corporation, 92 Gold Street, New York 38, N. Y.

GENERAL PRECISION EQUIPMENT CORPORATION

THE GPE PRODUCING COMPANIES

(I) KEARFOTT COMPANY, INC. (II) INTERNATIONAL PROJECTOR CORPORATION (III) BLUDWORTH MARINE
(IV) GENERAL PRECISION LABORATORY INCORPORATED (V) THE GRISCOM-RUSSELL COMPANY (VI) LINK AVIATION, INC.
(VII) SHAND AND JURS CO. (VIII) THE HERTNER ELECTRIC COMPANY (IX) THE STRONG ELECTRIC CORPORATION
(X) J. E. McAULEY MFG. CO. (XI) ASKANIA REGULATOR COMPANY (XII) AMPRO CORPORATION (XIII) LIBRASCOPE, INCORPORATED



The Sinclair Pipe Line Company and Rockwood have developed a new integrated fire protection system that is actually built into this Sinclair Pipe Line Company floating roof tank at Humboldt, Kansas.

A new approach to floating roof tank protection

Now for the first time, an integral Foam-making and Foam-distribution system that brings truly modern fire protection to floating roof tanks.

Tank fires usually occur in tanks of the floating roof type. Lightning is the chief cause of these fires.

Portable Foam hose lines could put out these vapor seal fires — *if* there was sufficient manpower — *if* the Foam lines could be placed into operation soon enough — *if* the hose streams could be brought close enough to the fire. There were too many "ifs" to this system. There must be a better way — and there was!

Rockwood, working in conjunction with Sinclair Pipe Line Company, developed a unique and practical method —

A compact, more economical, more effective integrated system that is actually built into the tank! This system insures speedy Foam delivery and distribution in the critical vapor seal space between the tank wall and the floating roof.

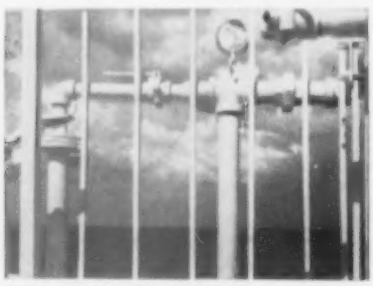
Here's an entirely new approach to protecting floating roof tanks. It not only minimizes losses, but permits the fire to be put out by one man if necessary and increases the safety of fire fighting personnel. Write for full information on this unique fire fighting idea!

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

Distributors in all principal cities

Tee-shaped Distributor Nozzle discharging Foam from Rockwood Foam Maker Unit into vapor seal space between floating roof and tank wall.



This stair platform at top of tank shows the Foam Hydrant (top right) and Rockwood Foam Maker Unit (center) which is located so as to deliver Foam to roof area below stair platform.

Gasoline engine driven fire pump, Foam liquid storage tank and Rockwood around-the-pump Foam proportioning system at Sinclair's Humboldt Station. This unit has a Rockwood "L" type Metering Valve and Rockwood "B" proportioner.

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1581 Harlow Street
Worcester 5, Mass.

Please send me full information on the Rockwood Integral Foam-making and distribution system.

Name.....

Title.....

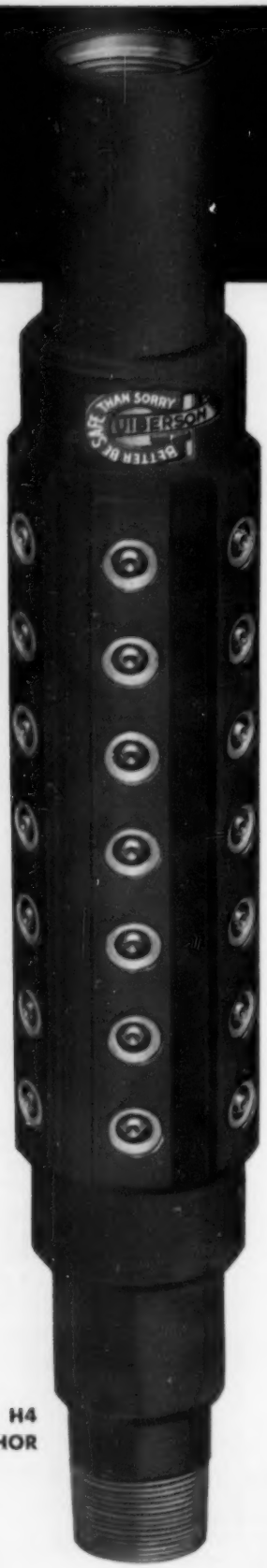
Company.....

Street.....

City.....Zone...State.....

GUIBERSON'S TYPE H4 *Hydraulic Anchor*

with MORE FLUID BYPASS



TYPE H4 ANCHOR

The channeled body H4 Anchor gives you four operational improvements — faster going in, better circulation in the hole, faster pulling out and simpler clean-up.

Completely automatic in operation, the H4 incorporates a body designed for unusually large bypass area and tremendous holding power. It has a husky fishing connection on top. Case hardened piston slips are retained by a stainless snap ring that holds the slips in retracted position while going in or pulling — keeps the slips from dragging on the casing wall.

We recommend the H4 for holding down production-type packers in acidizing, fracturing or other below packer pressuring operations. The H4 not only improves circulation, but speeds up operations and cuts down maintenance costs.

Guiberson H4 Anchors are individually tested and available in a full range of casing sizes.

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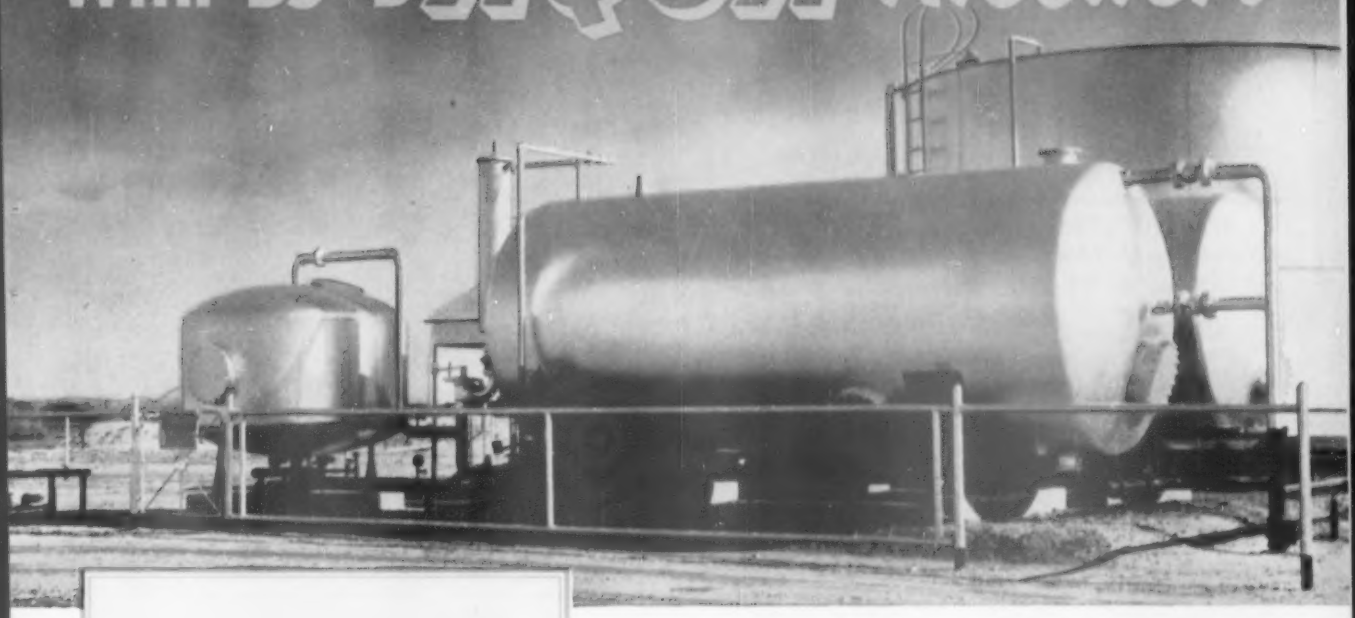
GUIBERSON
CORPORATION

ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.

Sold By Leading Oil Field Supply Stores Everywhere

Prevent Clogging of Water Injection Wells With BS&B AQUA-Kleener!*



AQUA-KLEENER FILTERS GIVE BEST RESULTS BECAUSE:

Permeable Underdrain Plates . . .

1. Eliminate filter bed disruption since only one grade of filter medium is required.
2. Prevent the filter medium from being carried out with the filtered water.
3. Serve as excellent flow distributors during backwash and allow more thorough cleaning of the filter medium. Channeling is eliminated.
4. Reduce maintenance because filter medium is not lost with the filtered water. Filter bed never has to be rebuilt because of disruption.

Removes Solids And Oil Traces From Water Without Chemical Treatment

AQUA-KLEENER conditions water for sub-surface injection, offshore disposal or surface disposal. Through an improved process of settling and filtering it removes oil traces and solid particles from lease-produced water, well water or surface waters and greatly extends the service life of water injection wells.

Each of the four components of the BS&B AQUA-KLEENER System—oil skimmer, filter, backwash tank and the BS&B "Filta-Wash"*—can be utilized separately or in various combinations as determined by the type of application and the degree of water conditioning required. Each can also be effectively utilized to improve existing installations.

Although the BS&B AQUA-KLEENER Filter can be used as a graded bed filter with efficiency at least equal to that of other systems, the recommended use of the filter with permeable under-drain plates and Anthrafilt No. 1 as the filtering medium will give longer filter runs and superior results at a much reduced maintenance cost.

* AQUA-KLEENER and FILTA-WASH are trade names of Black, Sivalls & Bryson, Inc.

BS&B

For Full Details on the BS&B AQUA-KLEENER System, Contact Your Nearest BS&B Representative — Or Write to . . .

BLACK, SIVALLS & BRYSON, INC.

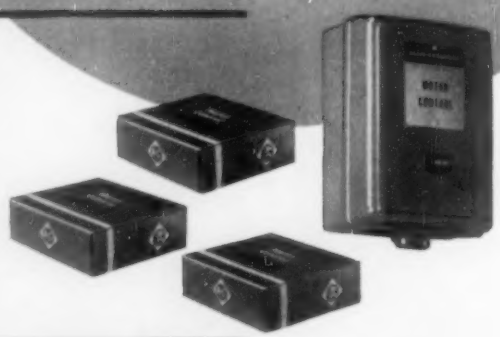
Oil & Gas Equipment Division, Dept. 1-A-6

1708 West Main Street — Oklahoma City, Oklahoma

ALLIS-CHALMERS

MOTOR CONTROL

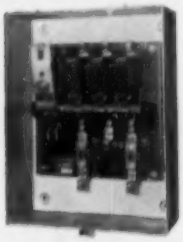
a Complete Line



SIZE 0-3 STARTERS

Converta-Kits Permit Easy Modification of Basic Starter

You get MORE . . . more flexibility with Allis-Chalmers control. A screwdriver and the proper *Converta-Kit* are all you need to change a basic Allis-Chalmers size 0-3 starter into the exact unit demanded by your production. *Converta-Kits* are available for push-button, selector switch and electrical interlock modifications. Starter replacement parts—contacts, magnetic coils and overload relays —are also available in packaged kits.



1. Arc across contacts as they start to open.
2. Strong blowout action forces arc to center.
3. Contacts fully open — arc extinguished.

NEW LINE OF SIZE 4-5-6 STARTERS

Quick Quenching Extends Contact and Chute Life

Heart of these starters is a new contactor which uses a revolutionary principle of arc interruption. In centering the arc, increased blowout action and fast quenching result from a combination of thermal convection and magnetic action. Since the arcing time is sharply curtailed, contact and chute life are greatly extended.

HIGH VOLTAGE STARTERS

Complete "Line-to-Load" Control and Protection

Allis-Chalmers Type H starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors . . . for full or reduced voltage — reversing or non-reversing — with plugging, dynamic braking and multi-speed features. Built into the starter is the type and degree of protection dictated by the application.

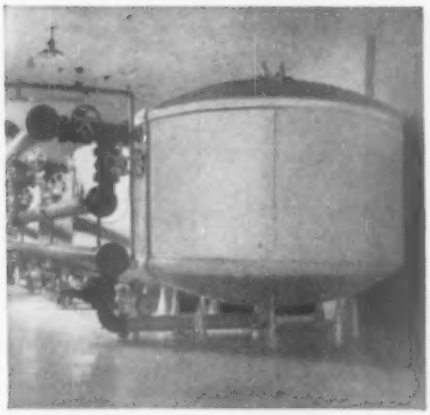
What is your control problem?

As manufacturers of a diversified line of industrial equipment, Allis-Chalmers has solved thousands of control application problems. This specialized experience is yours when you specify Allis-Chalmers control. See your Allis-Chalmers representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

Converta-Kit is an Allis-Chalmers trademark.

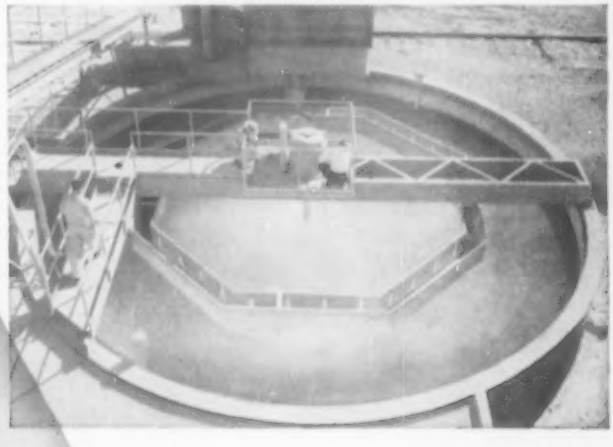
A-4988

ALLIS-CHALMERS



Why General Filter?

There are many reasons why municipalities and industries have installed General Filter water treating plants:



INSTALLATION SUPERVISION . . . General Filter "job-engineers" each installation to the consulting engineer's specification . . . supervises the installation and trains the personnel who will work with the equipment.

OPERATIONAL DEPENDABILITY . . . for twenty years General Filter has concentrated all of its efforts toward "better water treatment". Their efforts have produced water treating plants and equipment that are *completely* dependable.

ENGINEERING KNOW-HOW . . . General Filter's design and construction engineers are familiar with the problems involved in water treatment.

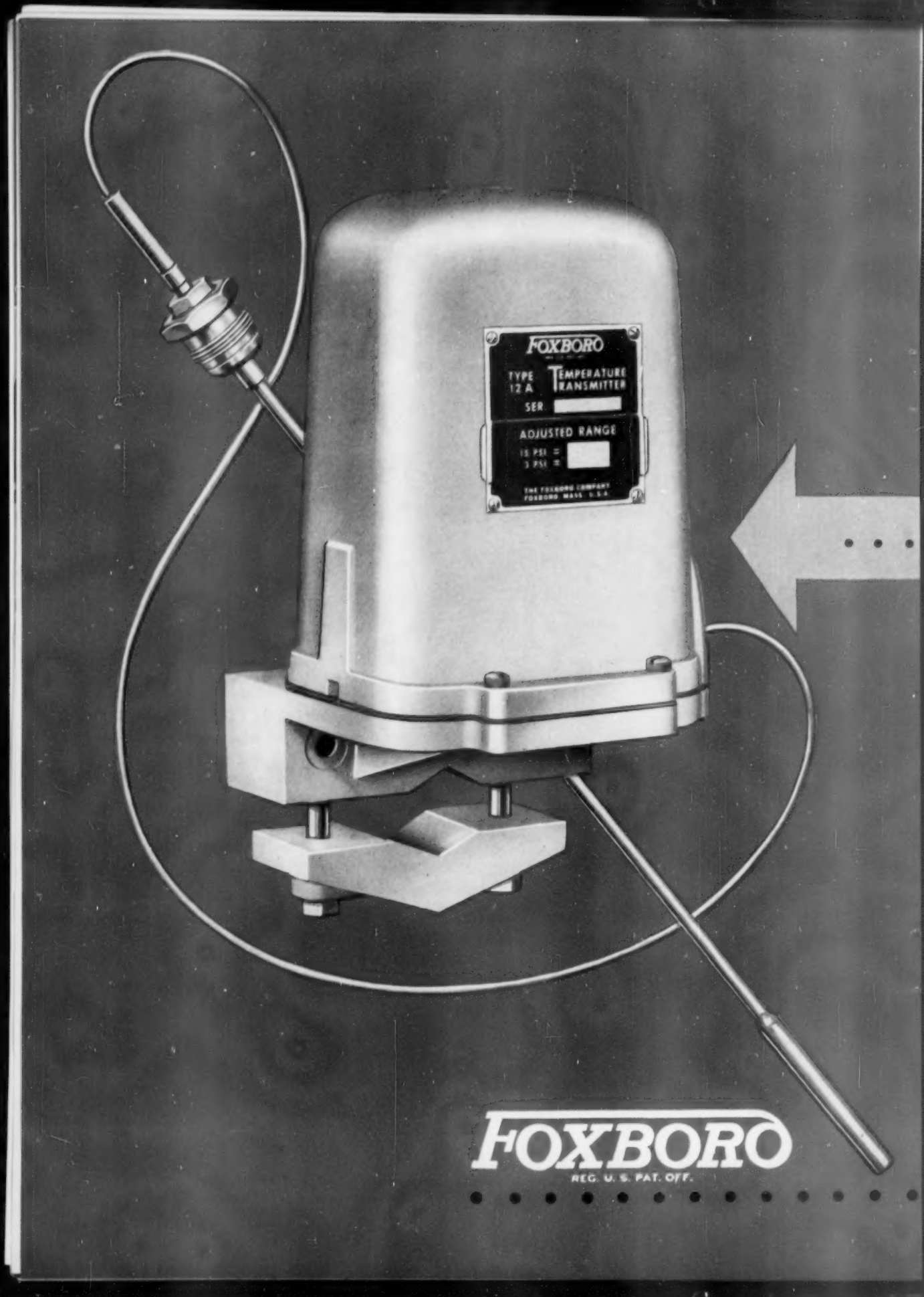
GREATER ECONOMY . . . the only real test of economy is a long term test. General Filter plants stand up over the years providing "better water" with minimum maintenance, longer trouble-free, smoother operation.

Find out why you should specify General Filter . . . Write today for detailed information regarding your water treatment problems.

General Filter Company
AMES, IOWA

". . . better water"

AERATORS • FILTERS • TASTE AND ODOR • ALKALINITY CONTROL • HIGH CAPACITY RESINOUS ZEOLITE • IRON RUST REMOVAL • DEMINERALIZATION • SOFTENERS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TYPE 12 A TEMPERATURE TRANSMITTER
SER.
ADJUSTED RANGE
15 PSI =
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Rugged, Versatile Temperature Transmitter Improves Remote Control

. . the Foxboro M/12A (pneumatic)

There is no easier, simpler way to measure remote temperatures, *fast*, over so wide a range, with such high sustained accuracy, and at so low a cost!

Between the limits of —100°F. and +1000°F., with operational spans of 50°, 100°, 200°, and 400°F, this rugged, highly responsive instrument performs outstandingly under the most severe conditions. It is compensated for ambient temperatures and pressure. Derivative action can be furnished for optimum performance when substantial thermal or transmission lags exist.

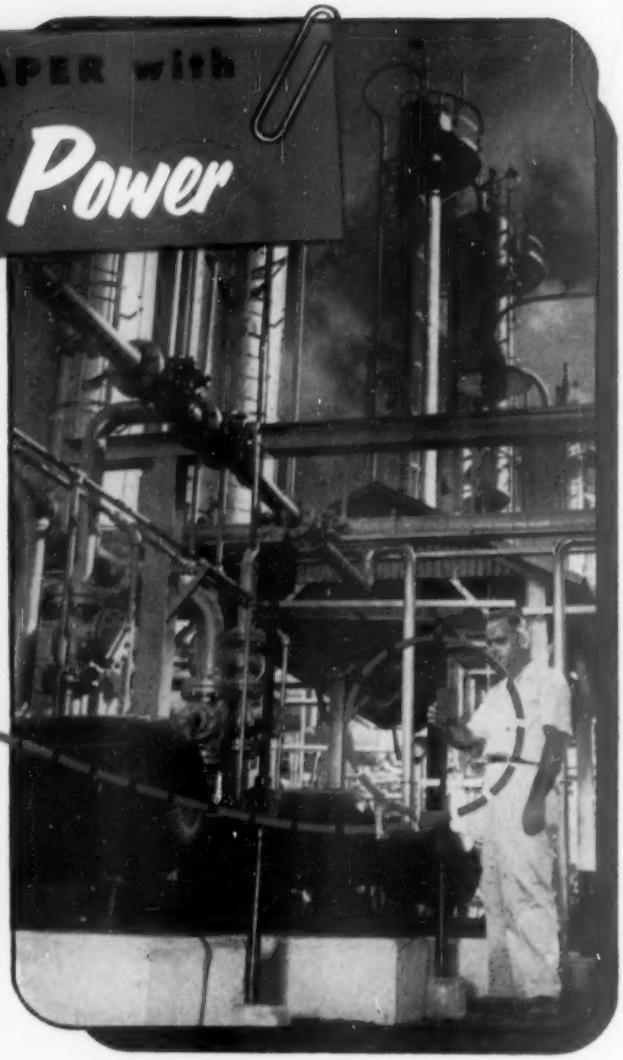
With its weatherproof housing and integral mounting bracket, it can be installed in any hazardous, corrosive, or outdoor location. Transmission lines are standard copper tubing, no electrical hazard, no costly capillary to run.

Write for Bulletin 13-17. It explains fully why the Foxboro M/12A Temperature Transmitter gives better performance with lower installation and maintenance cost. **The Foxboro Company, 606 Neponset Ave., Foxboro, Mass., U.S.A.**

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

Pneumatic Temperature Transmission

You can do it CHEAPER with
UTILITY Electric Power



Low Cost Power!

Utility Electric Power gives you just that . . . PLUS MORE! Wherever oil is lifted, moved, or refined, Utility Electric Power will do a great job! Low initial cost . . . low maintenance and operating costs . . . complete dependability around the clock . . . safety, convenience and automatic control to meet your power requirements. Yes, these advantages are yours when **Economical** Utility Electric Power is specified.

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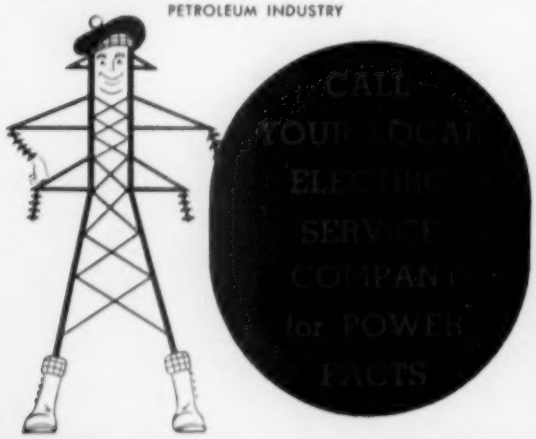
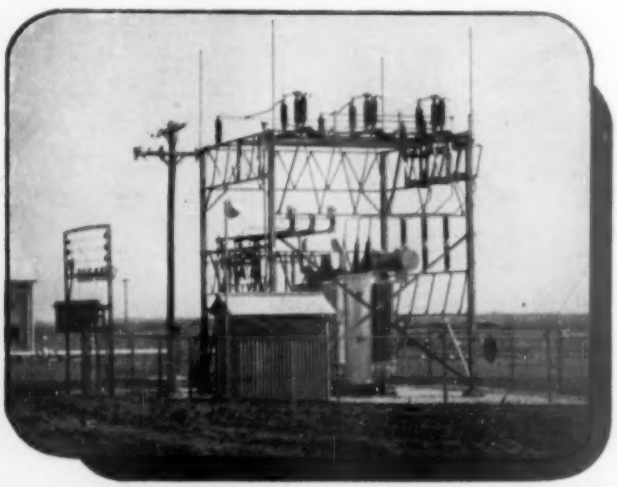
ORGANIZED IN THE INTEREST OF GREATER SERVICE TO THE PETROLEUM INDUSTRY





alkylation

...for "MOTOR" OCTANE

The persistent trend to higher compression ratios in automotive engines is focusing attention on alkylation as an important process means for increasing a refinery's Octane potential.

Foster Wheeler is currently designing and constructing an alkylation unit for a midwestern refiner which will produce 3800 bbl/day of motor alkylate. This unit features "effluent refrigeration," the most significant advance in alkylation technology in 15 years.

The unit shown in the photograph, recently completed for a South American refiner, is but one of the 17 alkylation units designed and constructed by Foster Wheeler. This cumulative experience is available to refiners everywhere — for evaluating the economics of the process and undertaking full responsibility for plant design and construction. For complete information, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

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Blast Furnaces and Open Hearths producing pig iron, ingots, blooms, billets and rods.

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Open Hearths producing ingots, blooms, billets and rods.

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Fine and Specialty Wire of all types including Manufacturer's Wire (Basic, Spheroidized, Annealed, Tempered, Bright and Liquor Finish, Low and High Carbon)—Welded Wire Fabric—Chain Link Fence—Galvanized Strand.

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CF&I Clinton, Mass.

Poultry Netting—Hex Mesh Nettings—Hardware Cloth—Industrial Wire Cloth—Alloy Processing Belts—Perforated Metals—Overhead Conveying Equipment—Sliding Door (Industrial) Hardware.

SELL; BUT TO SERVE...

. . . not only to make good steel products; but to make them still better . . . not only to fulfill today's requirements; but to anticipate tomorrow's—these are the principles that constantly guide CF&I."

This is—and always has been—CF&I's basic policy.

Next time you're in the market for steel or steel products, it'll pay you to contact CF&I.

CF&I Mt. Wolf, Pennsylvania
Insect Wire Screening and Industrial Wire Cloth.

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High Carbon Steel Wire (Hard Drawn, Spheroidized and Tempered)—Rope Wire—Tire Bead—Hose Wire—ACSR Core Wire—High Carbon Spring Steel Wire (All grades, tempers and finishes)—Regulator, Sash Balance and Flapper Valve Wire.

CF&I Roebling (Trenton), N. J.
High and Low Carbon Flat Wire (All tempers, edges and finishes)—Brush, Corset, Casing, Heddle and Drop Wire, Umbrella Wire and Tape Lines—Wire Rope—Strand, Aircord and Fittings—Wire Rope Slings—Electrical Wire and Cable and Magnet Wire.

CF&I So. San Francisco, Calif.
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CF&I Worcester, Mass.
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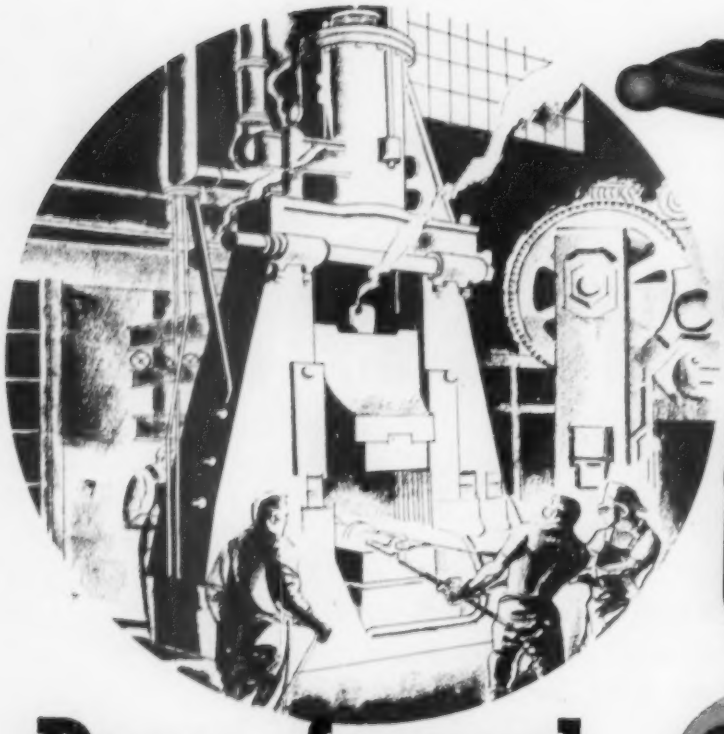
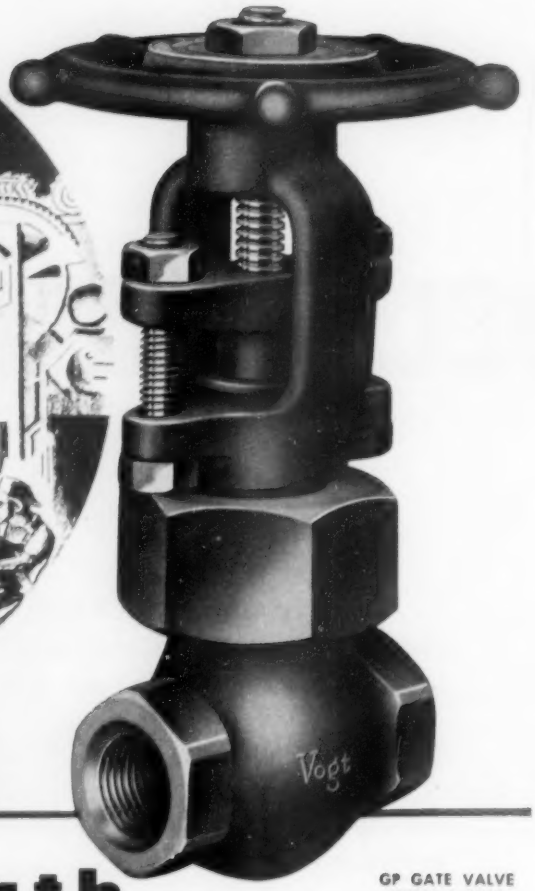
3 192





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SERIES 5-9530

Drop forged for Strength and Safety

Drop forging techniques, resulting from more than a half century of pioneering and development by Vogt in the production of forged steel valves, impart matchless strength and safety to the new line of Vogt GP Valves. Made from killed, clean, fine grained open hearth steel billets, forging and treatment operations result in additional grain refinement and increased toughness.

GP Valves are setting new standards of performance in petroleum refineries, chemical plants, power plants, and related industries. Available in a complete range of sizes from ¼" to 2" and rated 800 pounds at 850°F. and 2000 pounds at 100°F.

Advt. No. 4 in a series describing the features of Vogt GP Valves.

Write For Your FREE COPY of Supplement No. 1 to Catalog F-9. Address Dept. 24-FO.

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P. O. Box 1918—Louisville 1, Ky.

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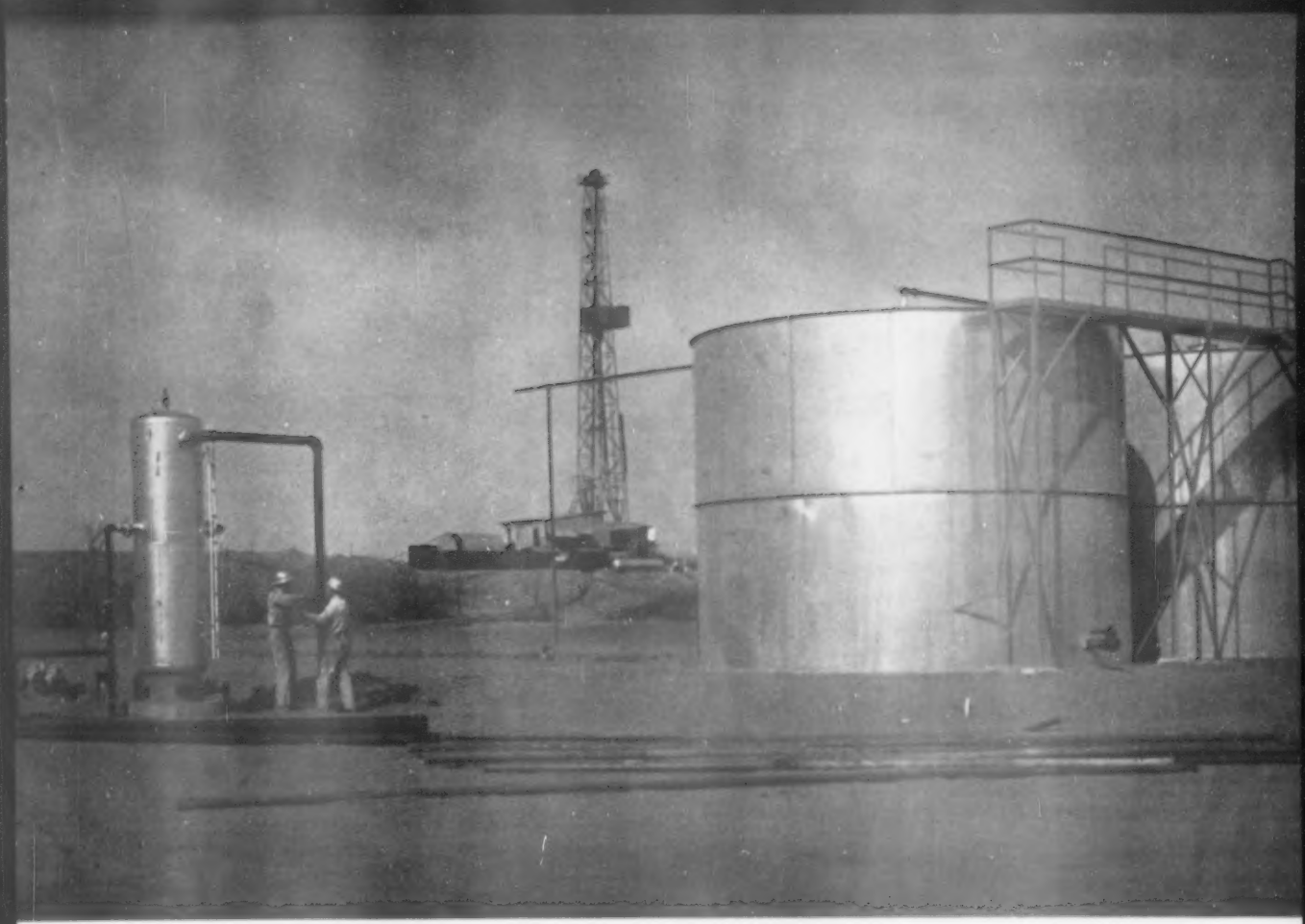
Vogt

GENERAL PURPOSE GP

Vogt FOR BETTER VALVES

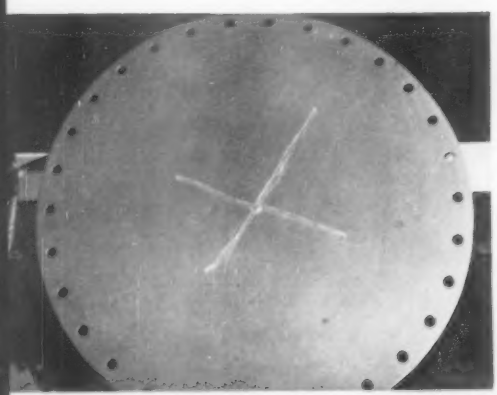
DROP FORGED STEEL

VALVES



Coating "still like new" after

8 years of sour crude oil service!



This is a hatch from one of the tanks in this test. The coating was 100% intact, the cross being deliberately cut to show the clean, perfect condition of the steel underneath. Data courtesy of **Plastic Coating Corporation,** Houston, Texas.

Protection of these oil tanks for sour crude service is a tough job. Corrosive conditions are always present. Yet, where coatings based on BAKELITE Brand Vinyl Resins are used, they are in excellent condition where others failed in 18 months to 2 years. No other type of protective coatings matched this record of 8 years.

Wherever you find severe service conditions, requiring resistance to moisture, corrosive atmospheres, acids, alkalies—whether applied to metal, masonry or other materials—rely on formulators of coatings based on BAKELITE Brand Resins. For names of suppliers, and a free copy of our booklet "BAKELITE Resin Coatings for Industry," write Dept. PK-128

Vinyl, Phenolic, Epoxy, and Styrene Resins for Coatings

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RESINS for COATINGS

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N.Y.

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New tower goes to English plant. Light, efficient, all-Monel nickel-copper alloy "Turbogrid" design reduces both construction and operating costs of this mesityl oxide unit designed by Shell Development Company.

New, all-Monel mesityl oxide tower points way to lower fractionating costs

Shell—designed Turbogrid unit is expected to operate at high capacity with low maintenance.

Things are popping in bubble tower design.

Take this all-Monel® nickel-copper alloy distillation tower. When all facts are in, it may prove the forerunner of all-Monel alloy construction for units where only carbon steel is used today. With this type of alloy construction, longer tower and tray life, lower maintenance, and greater operational versatility can be expected.

The column (shown here on its way to the Stanlow Refinery of Shell Refining and Marketing Company in Cheshire, England) separates mesityl oxide from hot, acid-treated diacetone alcohol. It is 55 feet high, fitted with 40 Shell Turbogrid trays . . . stamped from Monel alloy plate.

Slotted grids provide highly efficient vapor-liquid interchange. There are no dead zones. Pressure drop per tray is low and very high throughput is obtained. Fouling is slow. Cleaning easy.

The Monel alloy trays are amazingly light: because of simple construction (which results in low liquid hold-up) . . . and because the strength and corrosion resistance of the alloy permit thin gauges.

The result? Much lighter, less costly structure, and lower fabrication and construction costs.

In this instance the anticipated cost differentials justified Monel nickel-copper alloy for tower shell as well as trays. It is expected that actual operation will reveal additional savings. This would extend the use of this alloy to many refining and petrochemical fractionators where corrosion has been an accepted trouble in the past.

If you face this situation and would like to discuss the possibilities with one of Inco's Development and Research engineers, contact . . .

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THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO Nickel Alloys

Monel . . . *for minimum maintenance*

Confucius say:

"Don't be a sucker! ALL sucker rods are NOT alike!"

for utmost corrosion— resistance, top quality and long-lasting performance you can't beat

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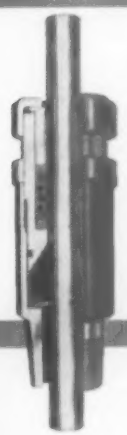
SUCKER RODS

A trip through the world's most modern sucker rod plant, the D+B plant at Garland, Texas will convince you that all sucker rods are not alike. Designed, built and tooled solely for the production of sub-surface pumping equipment, this plant combines 50 years of know-how with carefully-controlled manufacturing operations by expert workmen using special machines. It will pay you to get D+B sucker rods from your nearest CONTINENTAL or D+B store.



Save Time and Money with the New and Improved

DUAL-PAC STUFFING BOX

For ease of replacing the packing without killing the well, long wear, and a tight seal on the polished rod, you can't beat this time and money saving stuffing box.

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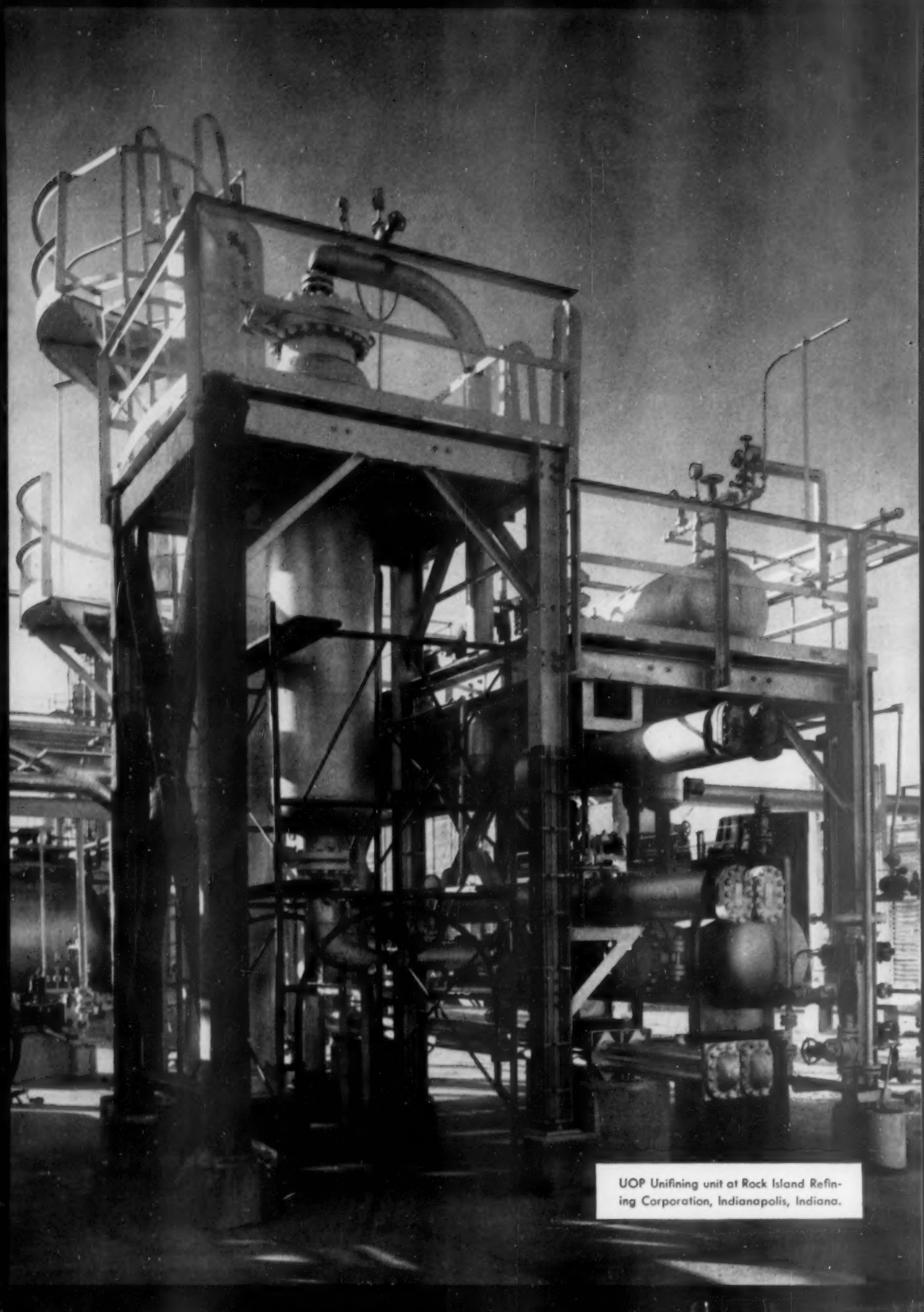

UOP Unifining unit at Rock Island Refining Corporation, Indianapolis, Indiana.

Unifining Solves Major Problem for Rock Island Refining Corporation

By L. E. Winkler
President
Rock Island Refining Corporation
Indianapolis, Indiana

Installation of a 300 barrel per stream day Unifining unit has solved a particularly knotty problem for us, and has enabled Rock Island Refining Corporation to raise the octane rating of its pool gasoline by a full number.

L. E. Winkler

Prior to the time the Unifining unit went on stream last September, our refinery had about 150 barrels a day of low quality vis-breaker gasoline which, if blended with Platformate from our UOP Platforming unit, catalytically cracked gasoline and other refinery stocks, would lower the octane number of the pool gasoline. Using it as a charging stock to the Platformer was uneconomical since the vis-breaker gasoline contained certain contaminants which are known to reduce the life of the catalyst. We were, furthermore, reluctant to make a large capital investment to improve this material, and we did not want to dispose of it as an inferior product.

Universal Oil Products Company designed and engineered the Unifining unit in such a manner that it required only a comparatively small capital investment to convert the vis-breaker gasoline into a choice stock for Platforming. Results obtained so far indicate that the unit will be amortized in about a year on the basis of tetraethyl lead savings.

The Unifining unit at our plant is considerably different from others now in operation. It operates at pressures substantially lower than those normally recommended for processing olefinic stocks; there are no compressors because the low operating pressure made it possible to design the unit to use excess hydrogen from the Platformer without recompression; there are no fired heaters since hot effluent from the Platformer serves to provide a portion of the heat required to maintain the Unifining reaction, and electronic instruments control the unit.

The total make of vis-breaker gasoline is charged to the unit in admixture with enough straight run gasoline to control the heat of reaction. The mixed stream picks up the required amount of hydrogen for the reaction and enters a heat exchanger to be preheated while the reactor effluent is being cooled. The balance of the required preheat is obtained by heat exchange against the reactor effluent from the Platformer. The hot charge flows over the Hydrobon catalyst, which is of the cobalt and molybdenum type, and reactor effluent is heat exchanged against incoming charge and cooled with water before entering a high pressure separator. Any unreacted hydrogen goes to fuel gas. The treated product is further reduced in pressure, then is mixed with the rest of the charge to the Platforming unit.

After Unifining, the total sulfur was reduced to 0.008 weight per cent from an original content of 0.143 per cent. Basic nitrogen has been lowered to less than one part per million when formerly it was 2.7. Arsenic has dropped from 120 parts per billion to less than one part. Only a trace of olefins remains in the product, whereas the charge contained 16 volume per cent. Paraffins have increased from 46 to 58 volume per cent. Naphthenes now are 37 volume per cent against 31 in the charge. Virtually no change is shown in ASTM distillation.

The electronic controls were chosen because we have received good service from similar instruments on the Platformer. This instrumentation was a factor in lining out the Unifining unit when it was placed on stream. Specification product was being produced within four hours after the startup. The controls were comparatively easy to install because of the experience we had on the Platforming unit. They are giving virtually trouble-free service.

Because of Universal's recommendation to install a Unifining unit, we now are converting a normally low quality product which we could not use profitably into a charging stock that is ideally suited for processing in our Platforming unit. Universal furnished the design and process engineering for the Unifining unit, which was built by refinery personnel.

(Advertisement)

INDIANA REFINER RAISES OCTANE RATING OF POOL GASOLINE BY INSTALLING UNIFINING UNIT

designed, engineered and licensed by

UNIVERSAL OIL PRODUCTS COMPANY

UOP

30 ALGONQUIN ROAD,
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Forty Years Of Leadership In Petroleum Refining Technology

Look at All You Get in the New Bendix LC IGNITION!

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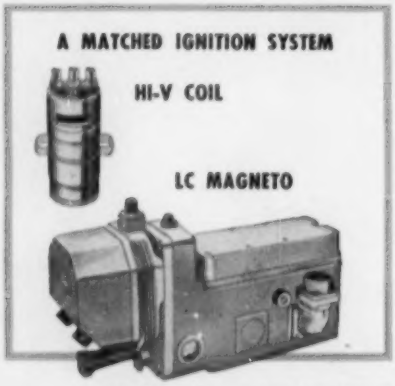
2. Simplified maintenance
3. Longer spark plug life
4. No unscheduled ignition shutdowns
5. Positive spark timing
6. High voltage output
7. Matched ignition system
8. Single or dual ignition
9. Flame proof
10. Low maintenance costs
11. For engines of 6 through 16 cylinders

Designed Specifically for the Petroleum Industry



Just check these outstanding exclusive features and you will know why the Bendix* LC Magneto has been engineered to meet the exacting requirements of the modern high-compression gas engines used so widely throughout the petroleum industry.

As the Bendix LC is a completely new type of magneto, it incorporates the latest development in material, engineering, design and production techniques. The result is a matched ignition system—LC Magneto plus Bendix Hi-V Transformer coils—that delivers more than ample voltage with greatly reduced maintenance costs.

For engines of 6 to 16 cylinders where top performance is a must, the new Bendix LC Magneto is the logical choice.

Complete descriptive folder is available on request.

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Bendix
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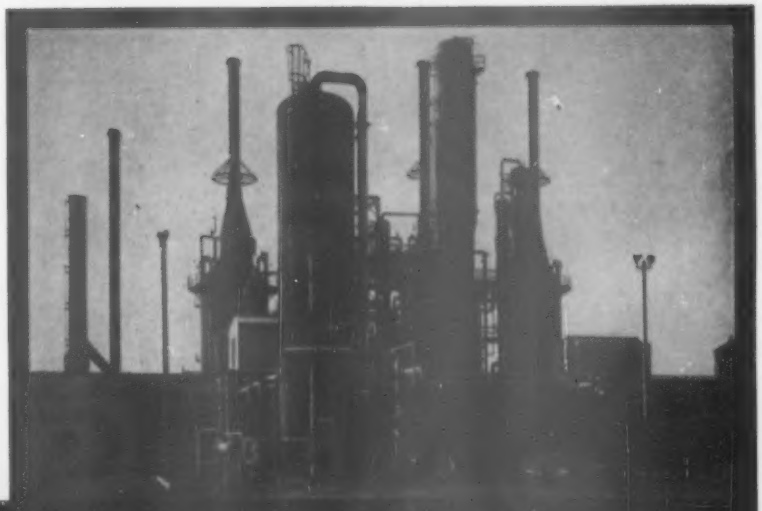
AVIATION CORPORATION

TO INSURE

smooth operations
more time on stream
lower operating costs
better products



TRETOLITE REFINERY SERVICES

DESALTING

Desalting the crude charge before refining is now accepted as standard operating procedure. Desalting removes salts which evolve into corrosive acids. It prevents salt plugging of condensers, exchangers and towers, and keeps solids and fines from entering the refinery. Tretolite desalting is an automatic, all chemical process, consistently delivering salt removals in the 98 to 100% range.

CORROSION PREVENTIVES

Kontol Corrosion Preventives combat internal corrosion, hydrogen blistering, fouling and scaling. They are organic semi-polar liquids which protect by adsorbing at metal surfaces as a tough, impervious film. They are readily adsorbed from dilute hydrocarbon solutions to form this film. In addition to their corrosion preventive properties, the Kontols are powerful detergents which clean and de-foul refining equipment.

FUEL EMULSION PREVENTIVE

Tretolite Fuel Emulsion Preventive is an organic, oil-soluble agent designed to prevent the emulsification and sludging of burning oils and diesel fuels. Oils treated with Tretolite Fuel Emulsion Preventive have shown no sludge formation even after a three month settling test.

METAL DEACTIVATOR

Kuplex Metal Deactivator effectively deactivates copper in hydrocarbons such as gasoline, kerosine, jet fuel, diesel oil, furnace oil and turbine oil. Its powerful chelating action prevents hydrocarbon deterioration caused by metal catalyzed oxidation.

For complete information, technical data and prices, ask your Tretolite refinery service engineer or write to –

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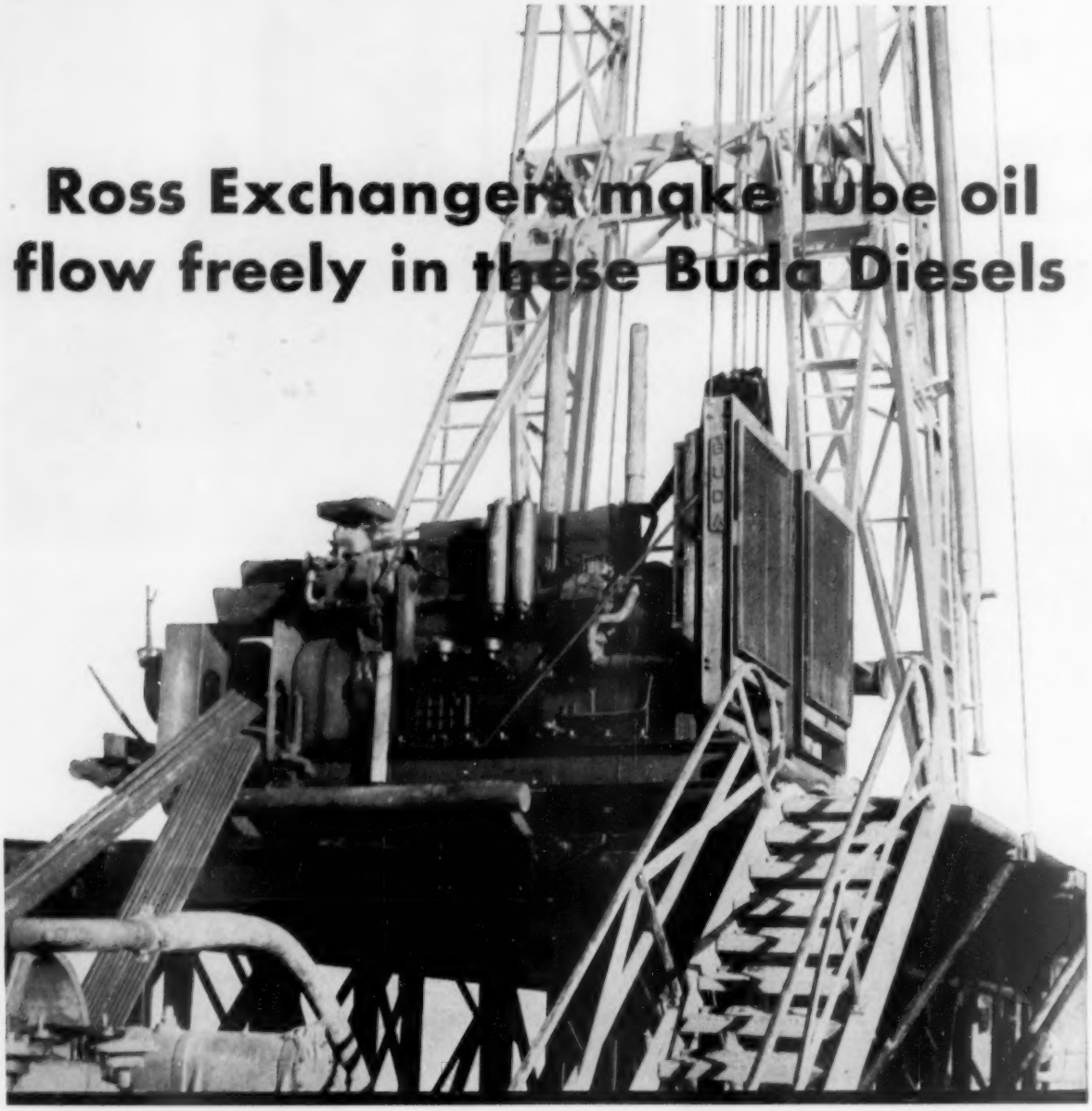
Chemicals and Services for the Petroleum Industry

DESALTING • DEMULSIFYING • CORROSION PREVENTING
SCALE INHIBITING • FUEL OIL ADDITIVES • WATER
DE-OILING • PARAFFIN REMOVING • PRODUCTION
STIMULATING • BACTERICIDES • METAL CONDITIONERS

Ross Exchangers make lube oil flow freely in these Buda Diesels



Designed for drilling rigs, these supercharged 6-cylinder Buda Diesel Engines are individually rated 340 hp at 1300 RPM.

To keep them at peak operating efficiency, they're equipped with Ross Type BCF Heat Exchangers to cool oil at high loads and heat oil at light loads. Uniform temperature and a continuous flow of oil through the filters are thereby assured.

Known the world over for their extreme ruggedness and high thermal efficiency, Ross Exchangers are the No. 1 choice of diesel designers. They are pre-engineered and fully standardized in a broad range of sizes to meet your needs.

Check with your nearest Ross representative or write direct. For detailed information, request Bulletin 1.1K5.

ROSS HEAT EXCHANGER DIVISION
of
American-Standard
1452 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kawneer-Ross of Canada Limited, Toronto 5, Ont.

This C-51 deseaming blowpipe opens transverse plate welds in steel barge bottoms 7 times faster than the previously used process.

Barges get new lease on life...

FOR 70% LESS COST

Deseaming blowpipes have cut the time required to remove these steel barge bottoms from 4 days per barge, to only 1½—and cut costs $500 per barge....

In this operation, the barges were rolled over in the water. Bottom plates were deseamed and removed, and then new plates UNIONMELT welded in position. Before removing the old plates, it was necessary to "open" seam welds, plug welds, and rivets. The deseaming blowpipes did this work with maximum speed and economy—and with minimum nicking into the support members beneath the plates.

Deseaming blowpipes operate with a low-velocity oxygen stream, and make a wide pass in metal at high speeds. The depth of penetration is controlled by regulating oxygen pressure. Lightweight, easy to handle deseaming blowpipes are speeding production and repair operations throughout industry.

For more information on this or any other of LINDE's modern, money saving processes, call your local LINDE representative. Start saving now, call him today.

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Division of Union Carbide Canada Limited, Toronto
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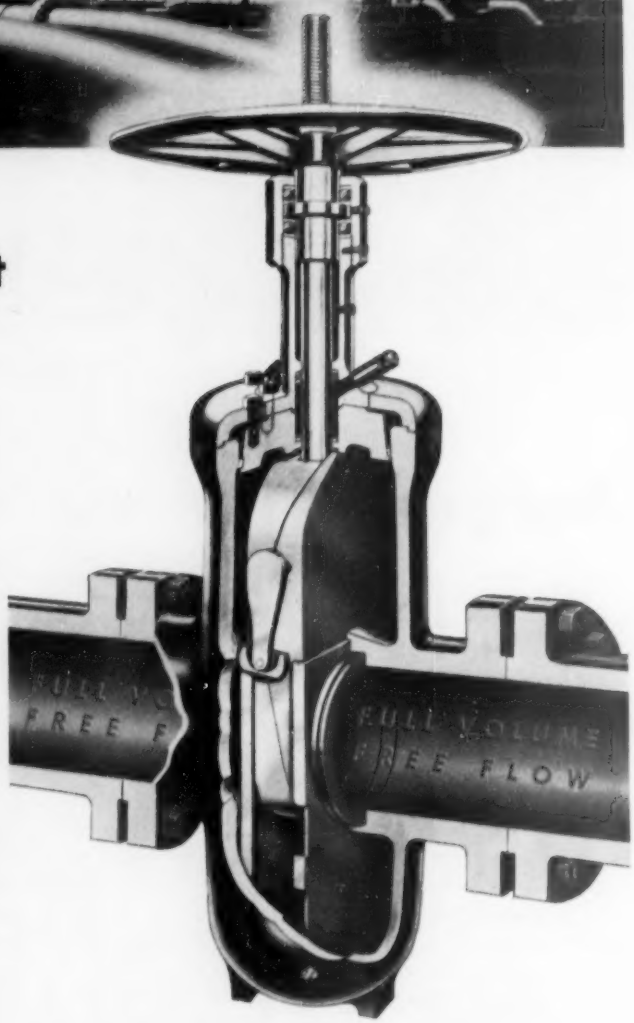
W-K-M
Through-Conduit
VALVES

Main lines with W-K-M Valves all the way are the "expressways" of pipeline transportation. The smooth bore through a W-K-M Valve is the same as the I.D. of the pipe and permits the same full volume, free flow as the pipe itself, and allows no more pressure drop or turbulence than an equivalent length of smooth wall pipe. Pump or compressor power is concentrated on transmission — not wasted overcoming obstructions. Scrapers may be run freely through the valves when cleaning the line.

Other advantages of W-K-M Pipeline Valves that contribute to their efficiency in service on the line are Leverlock Control of the parallel expanding gate; pressure seal bonnet that seals tighter as pressure increases; renewable seats; Superfinished stems, ball bearing operation for easier opening and closing under any conditions.

Write or ask your W-K-M Representative for our new pipeline catalog No. 300.



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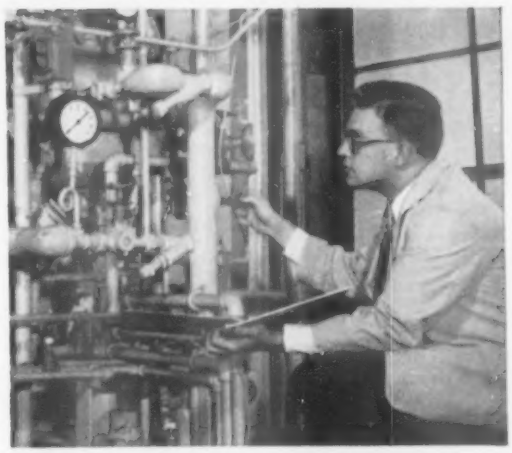
KEY RETURN BENDS AND FITTINGS

Use the Skill and Know-How of Pittsburgh's

415 Finishes Technologists



● Processes for producing new chemical compositions used in making better surface coatings for petroleum needs are developed in a special pilot plant.

● Newly formulated finishes are ground on a laboratory three-roll mill to test minute particles and dispersion.

Paint industry's most modern research facilities are at your service to provide tough, long-lasting finishes that resist corrosion and weather-wear . . . without increasing your payroll.

THERE IS A GROWING NEED for tougher and longer-lasting coatings to meet unusual conditions. This brings with it demands for tailor-made finishes that give greater protection against corrosion and weather.

● **To help you get** finishes that meet your most critical specifications, Pittsburgh now offers you the most modern facilities for fundamental and applied research in the paint industry. In its new Paint Research Center at Springdale, Pa., and in the development laboratories of its 11 paint plants, Pittsburgh maintains a staff of 415 chemists, engineers and technicians.

● **From this group have come** many important developments in finishes for the petroleum industry. Among these is Pittsburgh's brilliant synthetic White TANKHIDE Double Cover. This is a combination of intensely white controlled-chalking titanium pigments and weather-resistant vehicles. One spray coat of TANKHIDE Double Cover produces the same film thickness as two coats of conventional synthetic finish. This saves up to 25 percent in labor and time as reported by painting contractors. Besides brilliant white, TANKHIDE Double cover is available in colors.

● **If you have** new or unusual finishing problems on structures or equipment bring them to us. We'll gladly place our manpower and facilities at your disposal to develop superior coatings without adding to your payroll. Write, wire or call Pittsburgh Plate Glass Company, Industrial Finishes Division, 1 Gateway Center, Pittsburgh, Pa.

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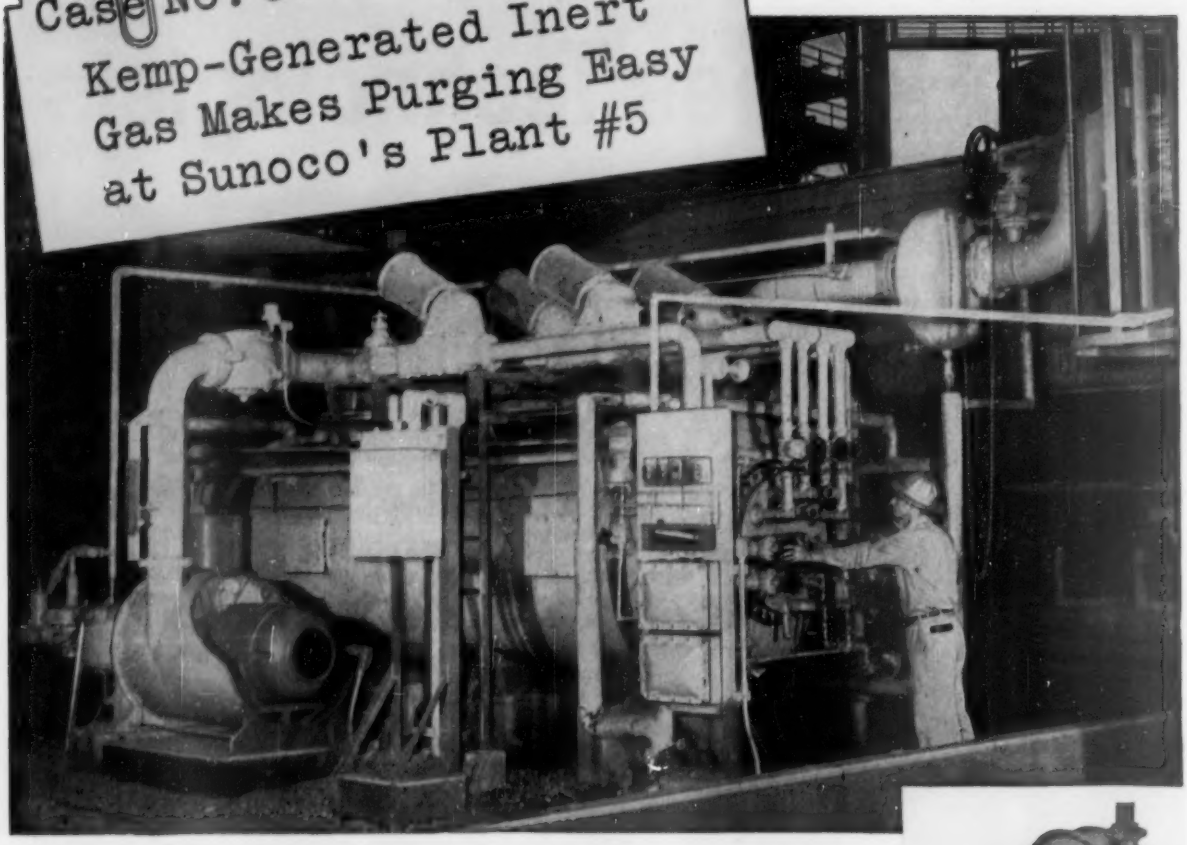
PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

● Films made with new compound and synthetic resins are tested in special equipment for tensile strength.

● Leading oil and gas companies in all parts of the world have used many types of special Pittsburgh finishes for years with uniform success.

Case No. 57
Kemp-Generated Inert Gas Makes Purging Easy at Sunoco's Plant #5



How Sun Oil's "Magic Mill" at Toledo operates with 'round the clock safety

There's no *one* word that strikes terror in the hearts of oilmen everywhere more quickly than F-I-R-E! To combat this threat at the Sun Oil Co.'s giant refinery at Toledo, Ohio, constant vigilance, checks and inspections are the answer. And the liberal use of inert gas for purging pipelines, tanks and crackers is essential to this safety maintenance.

Kemp selected to do the job

When plans called for *doubling* plant production in 1950, a new Kemp Generator (see above) was installed to insure adequate inert gas production. Fast-starting, easy-to-operate, this Kemp unit more than filled the bill. Today tanks and lines are periodically purged for inspection and cleaning *as often as needed*. And thanks to its 60,000 cu. ft. per hr. Kemp Inert Gas Generator, Sunoco enjoys *exact analysis* inert production that meets all its purging requirements.

Let Kemp help you, too

If you have a purging or blanketing problem, why not let Kemp Engineers give you the same helpful advice used so profitably at Sun Oil's Toledo refinery. It costs you nothing to investigate. And it may save you money. Find out how Kemp's wide range of dependable, low-cost Generators (complete with the latest fire checks and safety devices) offer you the best way to solve your problems.

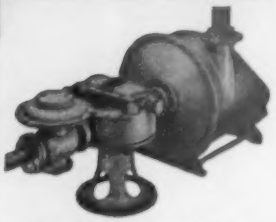
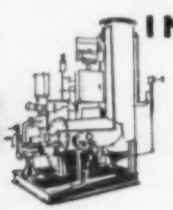


Photo above shows close-up view of Kemp Industrial Carburetor, the heart of every Kemp installation. Assures complete combustion... without waste, without tinkering. Reduces installation costs, simplifies maintenance.

For more complete facts and technical information, write for Bulletin I-10 to:
C. M. KEMP MFG. CO., 405 E. Oliver Street, Baltimore 2, Maryland.

KEMP OF BALTIMORE



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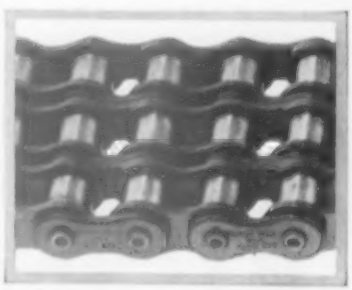
You need accurate pitch control in roller chains, too...

To provide the long service life you need from your drilling chains, Rex Roller Chains are manufactured with a revolutionary system of pitch control. The working load is distributed equally over all parts. No chance for the load to be concentrated on a single side plate with consequent early failure of the plate. The extremely accurate tolerances maintained...the complete balance of strength between parts...assure you longer service life and far less rig down time; and the "glide fit" of the pins assures easy assembly and disassembly.

For your cost's sake, investigate the chains with revolutionary pitch control—Rex Roller Chains...there's no better chain made! See your local supply store, your Rex® Field Sales Engineer, or write for your copy of Oil Field Catalog No. 55-3. CHAIN Belt Company, 4619 W. Greenfield Avenue, Milwaukee 1, Wisconsin.



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TWO HEADS ARE BETTER...

ONE counter registers gross gallons; the other records gallons corrected to a true volume at 60° F. base. The Dual Head Adaptor with time-tested A. O. Smith Temperature Compensator permits you to dispense gross gallons and keep your inventory on a net-gallons basis—a boon to accounting. Recommended for loading racks, refineries, pipe lines. Write for Bulletin SD-61.

Illustrated: Model B-50 single case steel meter with large numeral counter on the gross extension and ticket printer on the net side. Mount any two counters you choose on either side. All counters are adaptable to the dual head.

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PETROLEUM CHEMICALS DIVISION
NEWS

June ★ One of a Series of Bulletins for the Petroleum Industry ★ 1956

In This Issue . . .

1. YOU'LL BE INTERESTED in the new dry-dye eduction probe developed by Du Pont. It's described at the right.
2. HOW CAN *YOU* use the Du Pont automotive service discussed below to promote better relations with your large commercial fleet customers?
3. IF YOU HAVE a refinery in the Chicago area, you'll want to know Dr. Neal Lawson and how he can help you make the most efficient use of additives. See next page.
4. THE MOVIE is one of the most valuable of modern sales promotion and training tools. There's an article on the next page about four Du Pont movies produced to help you in your sales, training, and public relations.

They can help you turn complaints into sales

Our Du Pont automotive specialists have more than just faith in the high quality of your fuels and lubricants. They're always prepared to help you *prove* your quality story.

For example . . .

The operator of a fleet of tractors and other gasoline-powered farm equipment, complained about excessive valve burning. He was quite emphatic about blaming the trouble on fuel quality. And he had practically made up his mind to change suppliers when the oil company representative, accompanied by a Du Pont automotive specialist, arrived on the scene to investigate the trouble.

An impartial third party, the Du Pont man was able to convince the rancher that the fuel was not the real source of the trouble . . . but rather that it was the result of tractor operators tinkering with the air-fuel mixture ratio.

This is only one of many cases in which oil companies have been able to turn complaints into good will with the help of a Du Pont automotive specialist.

Our men often accomplish this through the use of the Du Pont fleet of fuel test cars, our single-cylinder demonstration engines and chassis dynamometers – in addition to their own wide experience in solving automotive problems involving the use of fuels and lubricants.

The services of these Du Pont automotive specialists are yours for the asking. And you can get in touch with one of them through any of our sales offices listed in the signature of this ad.

Faster, cleaner, easier gasoline dyeing now possible with new eduction development

A revolutionary new dry-dye eduction probe, developed by Du Pont engineers, can make gasoline dyeing a cleaner, faster and more efficient operation. The device, although simple in design, offers six distinct advantages over other gasoline-dyeing methods . . .

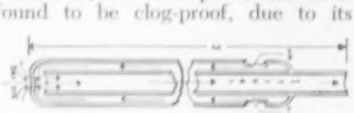
HERE IS a typical setup for using the new Du Pont Dry-Dye Eduction Probe. A short neoprene hose makes possible a permanent, yet completely flexible coupling.

1. "Dusting" is reduced. Exposure of operator and area to dye is minimized. Cleanup time is saved.
2. No plugging of the probe, hence no interruption of the dyeing process. No time loss for clearing plugged probe, and cleanup of area afterward.
3. Dye from the shipping drum can be introduced directly into the finished gasoline. Thus the step of pre-dissolving, required by some systems, is eliminated.
4. Minimum of operating skill required.
5. More pounds of dye are transferred per minute.
6. Minimum investment in space and equipment, considering the cleanliness of operation achieved.

Design and Operation

Conventional probes are little more than pipe sections, some with modified tips. Dipped into the drum, these probes suck up dry dye and pass it into the gasoline system. They are relatively inefficient, however. Extreme care is required of the operator – yet clogging is still likely to occur from time to time. This means interruption of the dyeing process – both to clear the probe and to clean up the area.

In many field tests and under varied conditions, the new probe has been found to be clog-proof, due to its



unique design. It is an aluminum tube within a larger one. The inner tube,

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

CONTINUED *Eduction Development*

like the earlier probe itself, transfers the dye from drum to main system. However, the outer tube supplies a down-draft of air, controlled by two adjustable ports at the head end, which insures continuously fluidized flow of dry dye that is uninterrupted by clogging. This feature is an important time-saver.

Dyeing Speed

The new eduction probe makes possible faster dyeing. Tests in units currently in use show speeds ranging from 18 pounds per minute for Du Pont Oil Orange to 40 for Du Pont Oil Red.

The Complete Eduction System

The principal factors responsible for the successful operation of a complete dry-dye eduction system are:

1. Adequate air handling capacity
2. Proper suction-line design
3. The probe described above

A smooth line from the mouth of the probe to the eductor is essential to avoid plugging. The dye probe should be permanently coupled to a short length of neoprene hose. The entire line from the mouth of the probe to the eductor should be of 1-inch inner diameter and completely unobstructed. It should be as short as possible, preferably not over 10 feet. The shut-off valve employed should be of a type permitting full-round flow. Pressure gages guide the operator.

Eduction systems can be used to transfer other fine crystalline materials as well as dry dyes; for example, Du Pont Gasoline Antioxidant No. 29.

However, for the transfer of *liquids* — such as Du Pont Metal Deactivator and Gasoline Antioxidants Nos. 5 and 22 — a separate eduction system should be used. Use of the same system, first for a liquid, then for a dry product, might result in clogging caused by residual liquid in the line.

Low-cost Installation

Your present dyeing facilities can probably be modified to utilize the features of this system at relatively low cost. A Du Pont Petroleum Chemicals Division representative will be glad to study your present system and make appropriate recommendations.

REGIONAL ADDITIVES SALES MANAGER

DR. NEAL D. LAWSON was recently appointed to the newly created post of Additives Sales Manager of the Du Pont Petroleum Chemicals Division's Central Region.

With headquarters in the Chicago office, he is in charge of sales and technical service work for all Du Pont additives other than tetraethyl lead. This includes Du Pont Metal Deactivator, lube and fuel oil additives, antioxidants, dyes, and grease stabilizers.

Prior to this assignment, Dr. Lawson was head of the chemical division of the Du Pont Petroleum Laboratory. He had previously been supervisor of the Laboratory's lube oil group.

Before joining the Du Pont Company in 1947, he was Research Assistant and Instructor in Petroleum Refining at Pennsylvania State University. His work there included research on the oxidation of lube oils, the influence of refining procedures on oxidation, and development of additives for lube oils.

Dr. Lawson is a chemical engineering graduate of Pennsylvania State College, where he also received his M.S. and Ph.D. degrees. He is a member of the American Chemical Society and Society of Automotive Engineers.

These Du Pont movies help promote your on-the-move industry

During recent years, audiences estimated at well over a million people have seen these four Du Pont-sponsored movies promoting your industry.

What Makes a Gasoline Good, a full-color cartoon movie, explains graphically and convincingly how refiners tailor gasoline quality to motorists' needs. Since the film's release, the Du Pont Petroleum Chemicals Division has made available to oil companies a total of 249 prints.

Pipeline on Wheels shows how gasoline tank trucks are made and operated for maximum highway safety. One hundred and seventy-five prints of this film have been made available for oil industry use. For 52 of them which were purchased and distributed directly by oil companies, we have no audience records. But the remainder, distributed by Du Pont on a loan basis, were seen by more than 61,000 people.

A total of 395 prints were made of the Du Pont movie, **It Never Rains Oil,** which tells the story of percentage depletion. Reports indicate that this film is doing an excellent job of creating a better understanding of this important issue.

The newest movie in the series is entitled, **When the Customer says "KNOCK."** It explains — for the benefit of service station operators and customer groups — the many mechanical and atmospheric factors (other than gasoline quality) which contribute to knock.

Prints of these films are readily available to you on a loan or purchase basis. Address your request to any of our sales offices listed below.

DU PONT

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.) *Petroleum Chemicals Division* • *Wilmington 98, Delaware*

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HOUSTON 2 — 705 Bank of Commerce Bldg. . . . . CApitol 5-1151
LOS ANGELES 17 — 612 So. Flower St. . . . . MAdison 5-1691
NEW YORK 20 — 1270 Ave. of the Americas . . . . . COlumbus 5-2342
PHILADELPHIA 2 — 3 Penn Center Plaza . . . . . LOcust 8-3531
PITTSBURGH 19 — Room 510, Alcoa Bldg. . . . . ATlantic 1-2933
SAN FRANCISCO 4 — Room 626, 111 Sutter St. . . . . EXbrook 2-6230
SEATTLE 3 — Room 215, 4003 Aurora Ave. . . . . MElrose 6977
TULSA 1 — P. O. Box 730 . . . . . LUther 5-3578

IN CANADA: Du Pont Company of Canada Limited—Petroleum Chemicals—85 Eglinton Avenue East—Toronto 12, Ontario—HUdson 1-6461
OTHER COUNTRIES: Petroleum Chemicals Division—Export Sales—Room 7496 Nemours Bldg.—Wilmington 98, Del.—OLympia 4-5121, Ext. 2962

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-2071

Printed in U. S. A.

with the O·C·T C-20 Casing Head

YOU DON'T REMOVE PREVENTERS UNTIL CASING IS SET AND SEALED!

Combining field-proved advantages with new engineering advancements, the Oil Center Tool Company "C-20" Casing Head provides operators with the first quick-setting, positive-sealing wellhead for medium depths. This original O-C-T design means a saving of costly rig time with simplified installation and added safety in the completion operation before removing blowout preventers. The sealing element, slip bowl and slips are assembled as a single unit that may be wrapped quickly around the casing, latched and dropped into place — thus eliminating the possibility of individual parts being installed incorrectly. All work can be done on the derrick floor without entering the cellar to install slips and seal assembly. The resilient seal ring provides an effective seal for the life of the well in any climate. Available through more than 700 supply store locations.

O·C·T

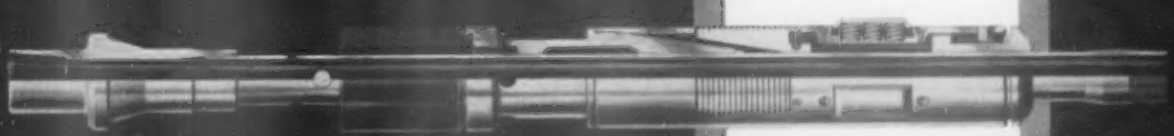
OIL CENTER TOOL CO.

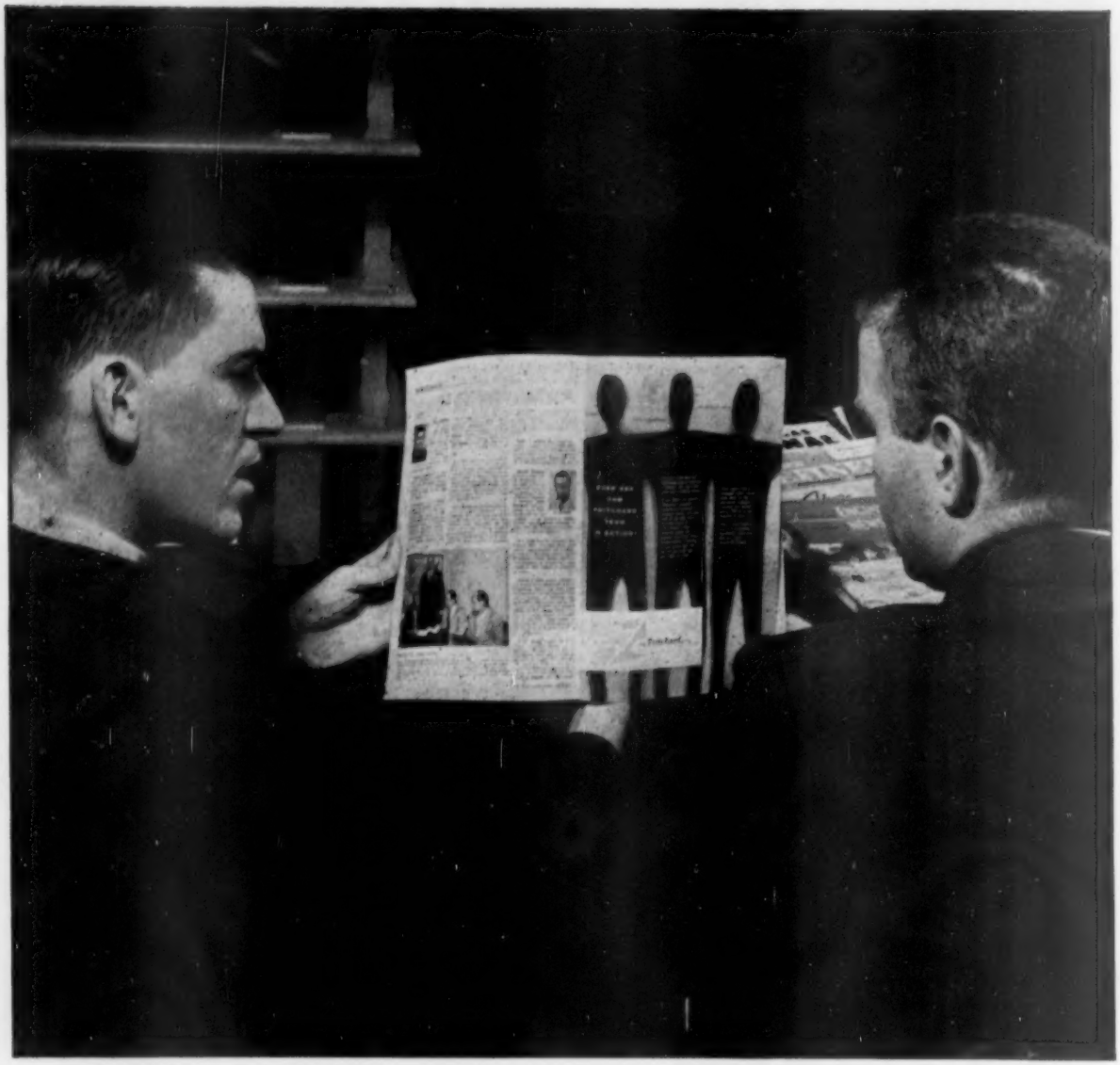
P. O. Box 3091, Houston, Texas

Export Representatives: Stanley Group—Le Grand, Sutcliff & Bell, Ltd., Rochester, Kent, England. South America—East West Oilfields, C. A., Del Lago Krtel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.

THE O-C-T TYPE JCW PRODUCTION PACKER

Isn't it time you found out about this O-C-T Packer? It runs, sets and pulls without any difficulty. It's a competitively priced premium packer.





"What do they mean by the 'Pritchard Team', Scotty?"

"What makes you ask?"

"I was just looking at this Pritchard ad, and it says, 'Ever See the Pritchard Team in Action?' and then it goes on to say, 'designers, engineers, construction superintendents work *with* your staff all the way from drawing board to on stream.'

"I keep forgetting that you've never seen Pritchard at work on a job. What they mean is that the Pritchard people work as a unit. And they work very closely with their clients' personnel, from the planning stage right down to the finished job. I've worked with them before, and I know why they call it a 'team'."

"I can see that you're sold on Pritchard, aren't you, Scotty?"

"You bet I am, and you will be too, when you see the Pritchard team in action."

"That'll be soon, too! They're working with us on our new plant."

J. F. PRITCHARD & CO.
4625 Roanoke Parkway, Kansas City 12, Mo.

"What do they mean by the 'Pritchard Team', Scotty?"

Pritchard is ready to serve you now in the following Petroleum Processes!

OIL FIELD PROCESSING

- Pressure Maintenance
- High and Low Pressure Recovery Systems
- Crude Stabilization
- Natural Gas Dehydration
- Sulphur Removal
- Light Hydrocarbon Recovery
- Elemental Sulphur Recovery
- Hydrocarbon Dew Point Control

REFINERY PROCESSING

- Distillation and Recovery Systems
- Thermal Reforming
- Cracking and Viscosity Breaking
- Catalytic Reforming
- Alkylation
- Polymerization
- Isomerization
- Crude Desalting
- Catalytic Desulphurization
- Lube Oil Desulphurization Handling and Packaging

PLUS . . . many types and facets of refinery offsite facilities construction.

Write for TIOGA Brochure

TIOGA

This interesting booklet describes and illustrates the Signal Oil & Gas Company's natural gasoline, H_2S removal and sulphur recovery plant at Tioga, N. D. Write for your complimentary copy on your company letterhead.

INDUSTRY'S PARTNER FOR PROGRESS

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SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES

BOSTON, CHICAGO, BUFFALO, HOUSTON, NEW YORK, PITTSBURGH

They Say—

Turbodrill Still Alive

"Dresser's proposed arrangement with the Russians gave them nothing they did not already have, and would have given us technical information of value and many years of extensive field experience. The petroleum industry in the free world is being deprived temporarily of an improved tool for certain types of drilling. I say temporarily because Dresser will, of course, go forward with its own development of the turbodrill and will continue to apply its technical knowledge to provide other new products to the oil industry to the limit of its ability.

"Although we do not agree with the technical findings of our Commerce Department, and neither do oil people we have consulted, we will cooperate with the Commerce Department in every respect and will abide by its ruling."

H. N. Mallon, president of Dresser Industries, Inc., Dallas, in statement following Commerce Department rejection of proposed arrangements with Russians.

Some New Engineers

"Some of the new branches of engineering are quite logical, and so engineers need not feel unduly flattered that their title has been adopted. It is stretching the term a bit, however, when we start having 'management engineers,' 'sales engineers,' and 'traffic engineers.'

"A slight break in the nomenclature was necessary when some of those engaged in designing furniture, equipment, and work space decided to call this activity 'human engineering.' The people who practice human engineering apparently hesitate to call themselves 'human engineers,' probably lest it be inferred that other engineers are not human. Or the ministers might begin calling themselves 'divine engineers.' It may well take one to get some of us into heaven!

"Today the term 'engineer' is being adopted or usurped for a wider and wider variety of activities. We may yet see the day when chefs are 'food engineers,' when subdivisions for 'salad engineers' and 'hamburger engineers.'

"On the whole, I think usurpation of your name has gone too far. Engineers may have to take steps to restore the prestige that made that name so popular in the first place.

"One possible solution might be to follow the trend toward double names,

"Freaks!" "Odd Balls!" "Rube Goldbergs!"

Those are typical comments made when people look through PROTO's new brochure of special tools—a valuable guide you should have. Remember, each is designed for an important job in industry—to break a production "bottle-neck," to handle unusual repairs, to service manufacturer's original equipment, etc. Special PROTO tools cut costs for industries and Government . . . and can do the same for you. PROTO engineers will help you solve your special tool problems. Your PROTO dealer will consult with you and aid in getting just the tools you need. Write today for brochure No. 5328 on special tools ("Odd Balls") to

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PROTO Makes Forgings, Too

With modern die-making facilities, drop hammer forges, high-speed forging machines, upsetters and hot forming equipment, PROTO can make almost any type of forging. Plants in Jamestown, N. Y., and Los Angeles, California, speed service.

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CANADA — with a complete line of fishing and cutting tools. Trained supervisors are available at all times in Canadian oil fields.

NEW YORK CITY — with a complete export division.

MEXICO CITY — with a full-time Homco employee handling equipment and services.

These new locations, combined with Homco's 41 branches in the United States, maintain Homco's leadership and position as the World's largest independent oil field supply and service organization.

Whatever you need in the oilfields — supplies — cutting or fishing — directional drilling — electrical well services — Homco has the men, the materials and the services near you to do the job and do it right.

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DIRECTIONAL DRILLING • FISHING AND CUTTING • OILFIELD SUPPLIES • ELECTRICAL WELL SERVICE

Whipstocks • Spud Bits • Deflecting Tools • Combination Jar and Key-Seat Reamers
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HOUSTON, TEXAS

HOMCO Export Division
509 Madison Avenue
New York City, N. Y.

THE OIL INDUSTRY'S MOST COMPLETE SERVICE

pioneered by the Esso Standard Oil Co. Real engineers might start calling themselves "engineering engineers." Needless to say, such engineers would confine themselves to the log scale on their slide rules. This all may sound a little fanciful, but I am told that an engineer at Ford once actually held the title 'Chief Engine Engineering Engineer.'

"For true engineers another good descriptive title would be 'energy engineers,' because that is what most of them really are."

Robert E. Wilson, chairman of the board, Standard Oil Co. (Indiana), in address accepting Washington Award of Western Society of Engineers, at Chicago.

Become An Educator

"Learning is falling in popularity. We must, on an individual and collective basis, improve our educational system by taking an active part in it. This is what we should do:

"... **Provide financial aid** to high-school graduates through scholarships, fellowships, and grants.

"... **Offer company-financed courses** to high-school science and mathematics teachers during the summer or provide summer jobs for these teachers.

"... **Work individually** at a local or community level by becoming members of boards of education, speaking before student groups, and interesting local groups in need for scientists and engineers.

"... **Utilizing the above suggestions** also at the college level."

Monroe E. Spaght, executive vice president of Shell Oil Co., in address to A.P.I. Safety and Fire-Protection Committee in Philadelphia.

Good Signs

"There are signs at this time that the industry is starting to give recognition to the highly important matter of offsetting higher costs by getting fairer prices for gasoline and other refined products."

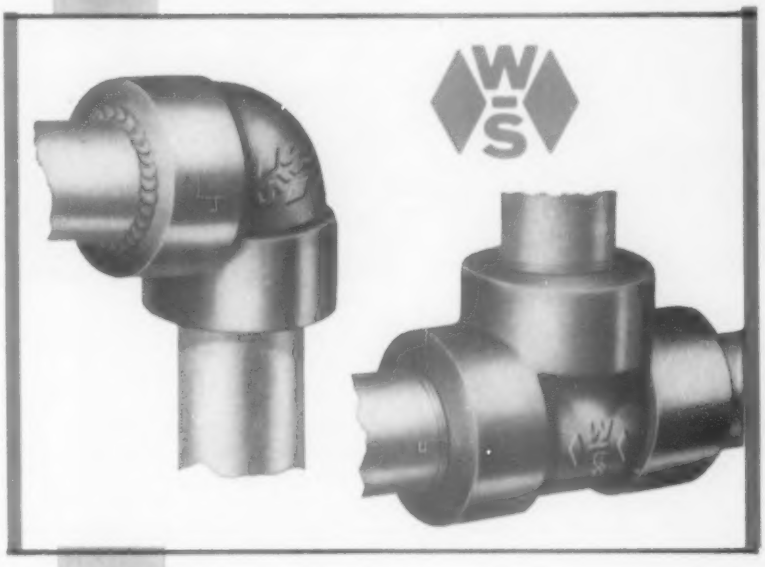
P. C. Spencer, president of Sinclair Oil Corp., commenting on product-price increases in letter to stockholders.

A Whiskey Still!

"Ten, 20, 30 years from now, the most modern refinery will seem as primitive as a moonshiner's whiskey still. This industry's best years are ahead of it. Its most astounding accomplishments are yet to come. They will come from the laboratories and refineries in Canada as well as those of the United States.

"For here, as in our own country, thrives the free spirit of enterprise. The

2 Safe Ways to PROTECT Pressure Piping...



W-S SCREW-END and SOCKET-WELDING FORGED STEEL FITTINGS

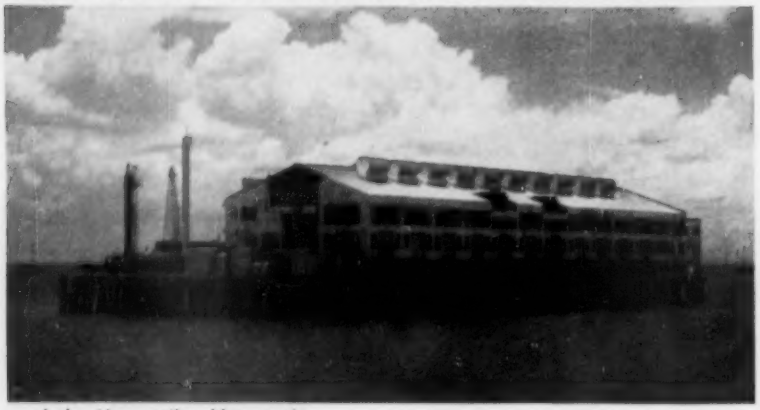
Pipe joints are potential trouble spots in high pressure piping systems. Change in direction of flow causes turbulence, erosion and vibration. Watson-Stillman fittings are made to absorb this type of punishment. They're drop-forged for strength and toughness and safety-factor designed for the protection of your piping.

Choose between a welded piping system and a screwed one to suit your needs. Then choose W-S Screw-End or Socket-Welding Fittings to join your pipe. They're available in sizes ⅛" to 4" for piping up to 6000 lb. W.O.G. class. For high temperature or corrosive service you can get W-S Forged Stainless and Alloy Steel Fittings, too. Send today for our informative catalogs.

W-S FITTINGS DIVISION

H. K. PORTER COMPANY, INC.
Roselle, New Jersey

HERE'S HOW DEPENDABLE, TROUBLE-FREE PRESSURE SUCTION, FLOW, COMPRESSION, SPEED CONTROLS WORK



Lake Maracaibo, Venezuela

All Ten Creole Turbines Controlled by Askania Jet Pipe Regulators

Miles offshore the largest oil well turbine installation in the world... operating at the highest pressure...depends upon ASKANIA Jet Pipe Regulators for dependable, trouble-free service year after year! ASKANIA Regulators control the speed of the turbines as a function of suction pressure; also balance the flow between compressors. These operations are examples which show how the jet pipe regulator can be applied to *any oil field pressure suction, flow, compression or speed control problem.*

How the jet pipe regulator works

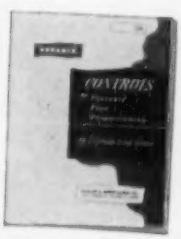
The HEART of each control is Askania's patented JET PIPE RELAY. It permits the translation of a minute signal from pressure (i.e. suction, flow, etc.) measurements into an instant, powerful, hydraulic force; it eliminates complex and expensive apparatus which is hard to maintain.

The Jet Pipe Relay is a pivoted stainless steel tube through which oil is pumped at high pressure. This oil discharges from the jet pipe nozzle at high velocity and impinges on two closely spaced holes in the distributor block which are connected to opposite ends of the work cylinder.

The jet pipe is balanced between two opposing forces. When these two forces are in balance and the jet pipe discharges oil which impinges equally upon both openings, oil pressures at both ends of the work cylinder are equal. No control action results. If the force balance is disturbed the jet pipe moves toward one opening and away from the other. This makes unequal oil pressures at opposite ends of the work cylinder, and the piston moves in the appropriate direction to correct this unbalance.

Applicable to these controlled variables

1. The control of compressors in fluid cat crack plants
2. The control of production and field pressurization
3. Pressure (Gage, absolute and differential) • Draft combustion • flow • level • depth • ratio • speed • density • consistency • edge position and others



What is your control problem? For information on the type of regulator which best fits your operation send today for bulletin No. 139 and 155. Write the Askania Regulator Company, 290 East Ontario St., Chicago, Ill.

ASKANIA REGULATOR COMPANY

"CONTROLS FOR INDUSTRY"

HYDRAULIC, ELECTRONIC CONTROLS & SERVOS, GENERAL SYSTEMS, ENGINEERING & COMPUTER SERVICE, VALVE ACTUATORS & CYLINDERS

A Subsidiary of General Precision Equipment Corporation

restless pursuit of new methods and new products, urged on by the goad of competition, assures you a steady flow of fresh creations."

Frank L. Porter, president of American Petroleum Institute, in address at midyear meeting of A.P.I. Division of Refining, Montreal.

Lindbergh's Gas

"It's interesting to note that back in 1927, Lindbergh in flying the Atlantic used the highest grade of aviation gasoline then known. It was all of 76 octane.

"Today's automobile engine could hardly run on so low a grade of gasoline."

James W. Ross, Chicago, assistant general manager of sales for Standard Oil Co. (Ind.), in testimony before Montana Trade Commission.

Scholar in South Africa

Dear Sir:

An article appeared in The Oil and Gas Journal dated October 25, 1954, entitled "How Ethylbenzene Is Made" by F. R. Garner and R. L. Iverson. It appears that yours is the only publication in which this paper was reproduced, and as this particular issue is unobtainable in South Africa, I would be very grateful if you would forward me a copy of this article by air mail.

I am a final year B.Sc. chemical engineering student at the University of the Witwatersrand, and am at present busy with a design project, to be completed in July, on the manufacture of ethylbenzene. In this connection, the above-mentioned article will prove invaluable.

John G. Kilroe
7 Rutland Rd., Parkwood,
Johannesburg, South Africa.

CALENDAR OF EVENTS

JUNE

6-7 Independent Oil Men's Association, annual convention, Statler Hotel, Boston.

6-8 American Society for Quality Control, tenth annual convention, Palais du Commerce, Montreal.

7-8 American Petroleum Institute, Oil Industry Information Committee, Conrad Hilton Hotel, Chicago.

10-15 American Petroleum Institute, Production Division midyear standardization conference, Brown Palace and Cosmopolitan Hotels, Denver.

11 American Gas Association and Independent Natural Gas Association of America, joint meeting of rate com-

Get More Hole For Your Wire Rope Dollar with

J&L SpringKore

Rotary Drilling Lines

SpringKore's tightly coiled, high quality steel spring center was developed by J&L to give rotary drillers a wire rope with unusually high resistance to crushing action *plus* extreme flexibility.

Check these features of J&L SpringKore Rotary Drilling Lines and see why you get longer service life on your rotary rigs at lower drilling line costs.

LONG-TERM FLEXIBILITY

SpringKore's highly flexible center and wide distribution of internal pressures maintains original rope flexibility under long periods of heavy-duty service.

RESISTS CRUSHING ACTION

Coiled steel spring center has great resistance to crushing . . . snaps rope back to its original shape and diameter.

COMPLETE LUBRICATION

SpringKore's hollow center acts as a lubricant reservoir . . . reduces corrosion and friction wear by assuring lubrication of innermost parts of rope.

MORE SUPPORTING CONTACT POINTS

The coiled shape of the spring center gives the strands of the rope more supporting points . . . reduces friction by spreading pressure evenly over many contact points.

UNIFORM DIAMETER

The firm internal support provided by the spring center maintains uniform rope diameter . . . reduces wear caused by outer strands rubbing against each other.

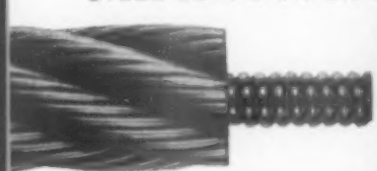
LESS INSIDE STRAND WEAR

The spring center flexes under crushing instead of scoring strands . . . reduces wear on inside wires.

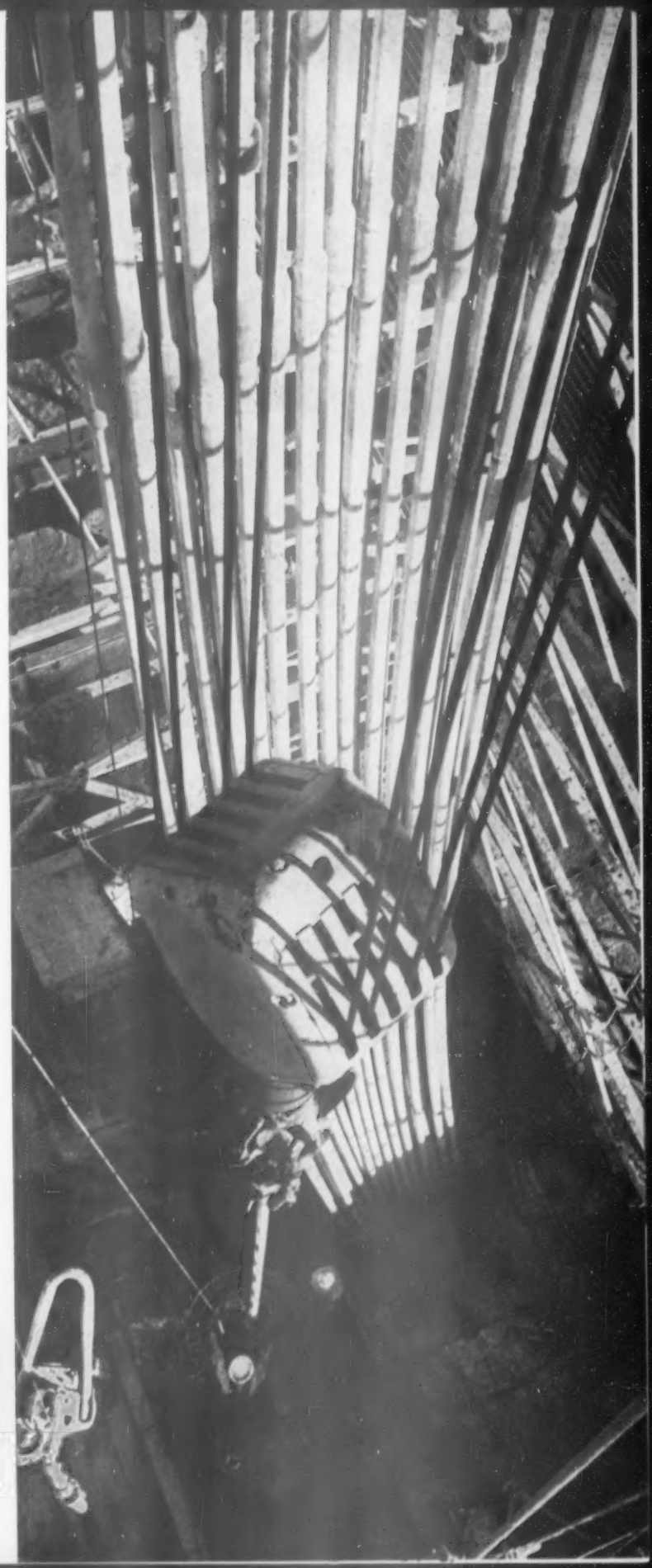
Put these SpringKore advantages to work on your rotary drilling rigs. Specify J&L SpringKore Rotary Drilling Lines. Available in standard sizes and construction.

Jones & Laughlin

STEEL CORPORATION · PITTSBURGH



J&L STEEL



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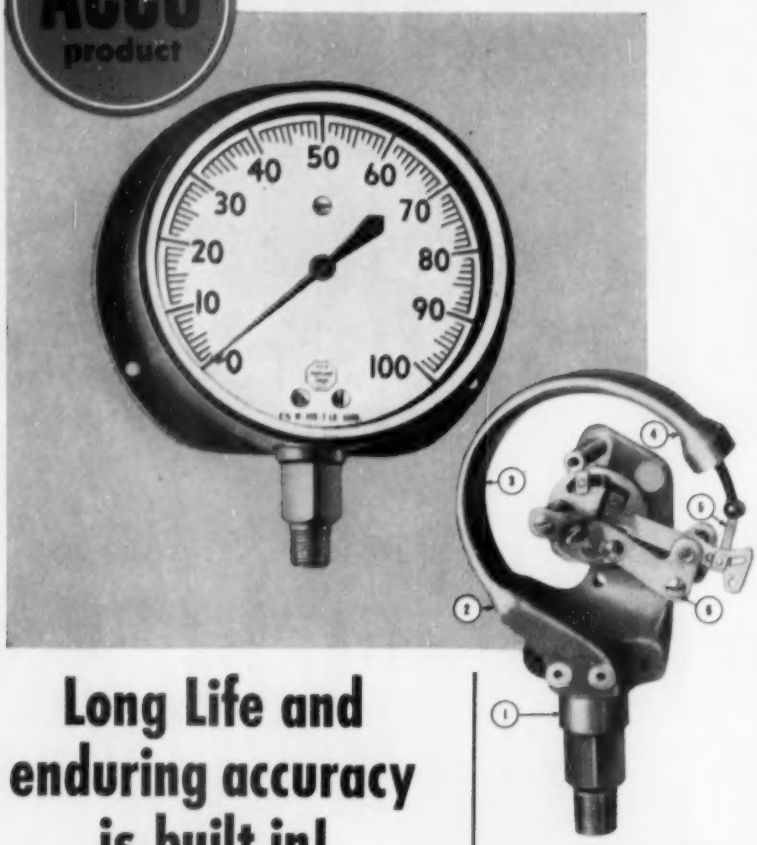
Helicoid Gages



Long Life and enduring accuracy is built in!

• Sustained accuracy of HELICOID Gages through years of hard service comes from superior design and construction.

The HELICOID Gage has many unique and exclusive features. It is not only a pressure instrument of the utmost precision but one that requires but a minimum of maintenance throughout a long service life.

The smooth rotation of the spiral movement and cam outlasts and outperforms other gage types. There are no gear teeth to wear out.

HELICOID Gages are available to meet every type of pressure indicating requirement. Ranges are from 15 to 20,000 p.s.i. and vacuum or compound.

Write for catalog today

Why HELICOID Gages last longer!

Socket (1) is one-piece drop forging, streamlined to reduce possibility of clogging.

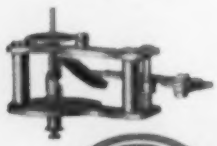
Bourdon tube* (3) is alloy steel, stainless steel or K Monel.

Tube is welded to forged socket (2) and tip (4).

Connecting link and link screws (5) are K Monel.

Helicoid movement (6) is corrosion resistant.

*Phosphor bronze tube also available.



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Helicoid Gage Division
AMERICAN CHAIN & CABLE

929-A Connecticut Avenue • Bridgeport 2, Connecticut

for Better Value

mittees, Shamrock Hilton Hotel, Houston.

11-15 American Institute for the Advancement of Science, Gordon Research Conference on Catalysis and Petroleum, Colby Junior College, New London, N. H.

12 A.G.A. rate committee, Shamrock Hilton Hotel, Houston.

13 I.N.G.A.A. rate committee, Shamrock Hilton, Houston.

13 Pennsylvania Grade Crude Association, thirty-third annual meeting, Bradford, Pa.

14-16 American Society of Mechanical Engineers, applied mechanics conference, University of Illinois, Urbana, Ill.

14-16 National Oil Scouts and Landmen's Association, thirty-third annual convention, White Plaza Hotel, Corpus Christi, Tex.

17-21 American Society of Mechanical Engineers, semiannual meeting, Statler Hotel, Cleveland.

17-22 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Atlantic City, N. J.

17-23 World Power Conference, Vienna.

21-22 Western Petroleum Refiners Association, regional technical—industrial relations meeting, Broadview Hotel, Wichita.

21-23 American Association of Petroleum Landmen, annual convention, Denver.

25-29 American Institute of Electrical Engineers, 1956 summer and Pacific general meeting, San Francisco.

26-29 Canadian Gas Association, Manoir Richelieu, Murray Bay, Que.

28-30 Rocky Mountain Oil and Gas Association, board of directors, Hotel Utah, Salt Lake City.

JULY

9-11 American Gas Association, American Petroleum Institute, Canadian Petroleum Association, committees on natural gas reserves, Banff, Alta.

17-27 Program on Recent Advances in Catalytic Polymerization, Massachusetts Institute of Technology, Cambridge, Mass.

18-20 Yellowstone-Bighorn Research Association, third Professional Short Course on Uranium Occurrence and Structural Geology, Red Lodge, Mont.

AUGUST

2-4 Rocky Mountain Mineral Law Foundation, Second Annual Institute, University of Colorado, Boulder.

20-21 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

27-29 Sixteenth Annual Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

5-7 Wyoming Geological Association, eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

9-12 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

11-13 Pacific Coast Gas Association, annual meeting, Coronado, Calif.

12-14 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

13-15 Chemical Institute of Canada, third Western Regional Conference, Edmonton, Alta.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

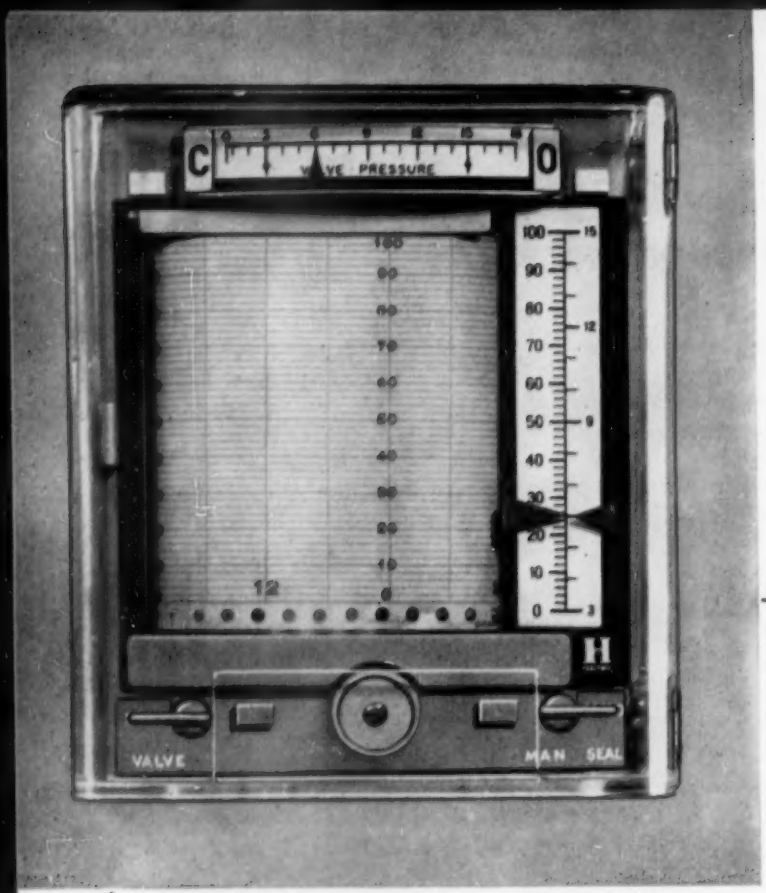
Magcobar means more than mud alone...
it means...

THE INDUSTRY'S LARGEST PRODUCING FACILITIES

Stretching to all corners of North America, Magcobar production facilities have expanded year after year to provide the oil industry with an abundant source of drilling mud materials for the present and the future. To accomplish this steady production progress, Magcobar has reinvested a far greater percentage of its income in additional production facilities for the oil industry than any other mud company. The scope of Magcobar plants is shown in this composite drawing. All these resources are provided for oil operators so that wherever they drill, whenever they drill, they may be assured of the same high quality product. Look for the Magcobar Dealer sign when you need mud.

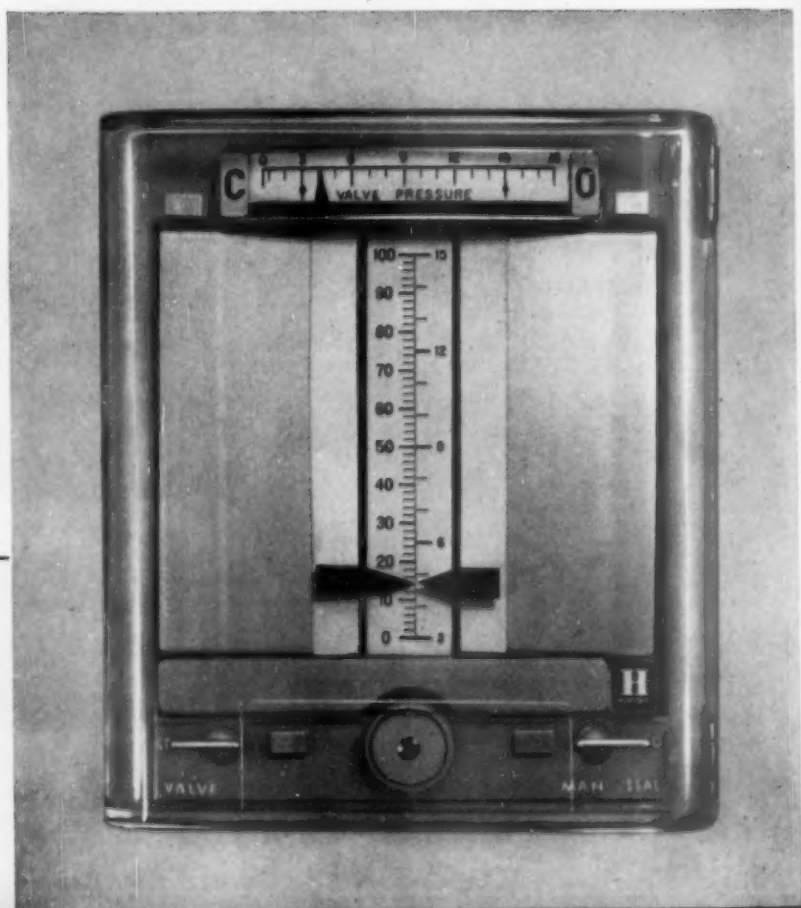
Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
ONE OF THE DRESSER INDUSTRIES
HOUSTON, TEXAS



for simplest

Both the *Tel-O-Set* indicator and recorder have vertical indicating scales on which large, opposing pointers clearly show measured value and set point. The control knob and transfer switches are located near the bottom of the case, where they can be manipulated without the operator's hand obscuring the view of the pointer and scale.



● **REFERENCE DATA:**

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The exclusive features designed into *Tel-O-Set* miniature instruments save you time, trouble and money . . . from the instant these instruments are installed on your control panels.

Easy installation. The indicating and recording chassis is a complete assembly that can be supplied separate from the case. Since the case contains the valve pressure gage and pressure regulator, you can install it in the panel, make complete piping connections . . . and then insert the instrument chassis later, at startup.

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Tel-O-Set instruments can handle a broad range of temperature, pressure, flow and liquid level applications. They work with any type of pneumatic force-balance controller. They are sensitive and accurate . . . have true linear calibration . . . respond instantly to changes in measured variables. For a discussion of how you can use them profitably, call your local Honeywell sales engineer . . . he's as near as your phone.

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16-21 American Society for Testing Materials, Second Pacific Area National Meeting, Statler Hotel, Los Angeles.
17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York City.
20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.
20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.
24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.
26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

OCTOBER

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.
2-4 National Association of Corrosion Engineers, south central region, Beaumont.
7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.
11-12 California Natural Gasoline Association, fall meeting, Sheraton Hintington Hotel, Pasadena, Calif.
14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.
14-20 OIL PROGRESS WEEK.
15-17 American Gas Association, annual meeting, Atlantic City, N. J.
18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.
18-21 Permian Basin Oil Show, Odessa, Tex.
22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.
29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.
29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

NOVEMBER

7-8 Philadelphia section, Instrument Society of America, Symposium on Process Data Logging, Stratford Hotel, Philadelphia.
8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.
12-15 American Petroleum Institute, annual convention, Conrad Hilton Hotel, Chicago.
19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.
25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

JANUARY (1957)

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

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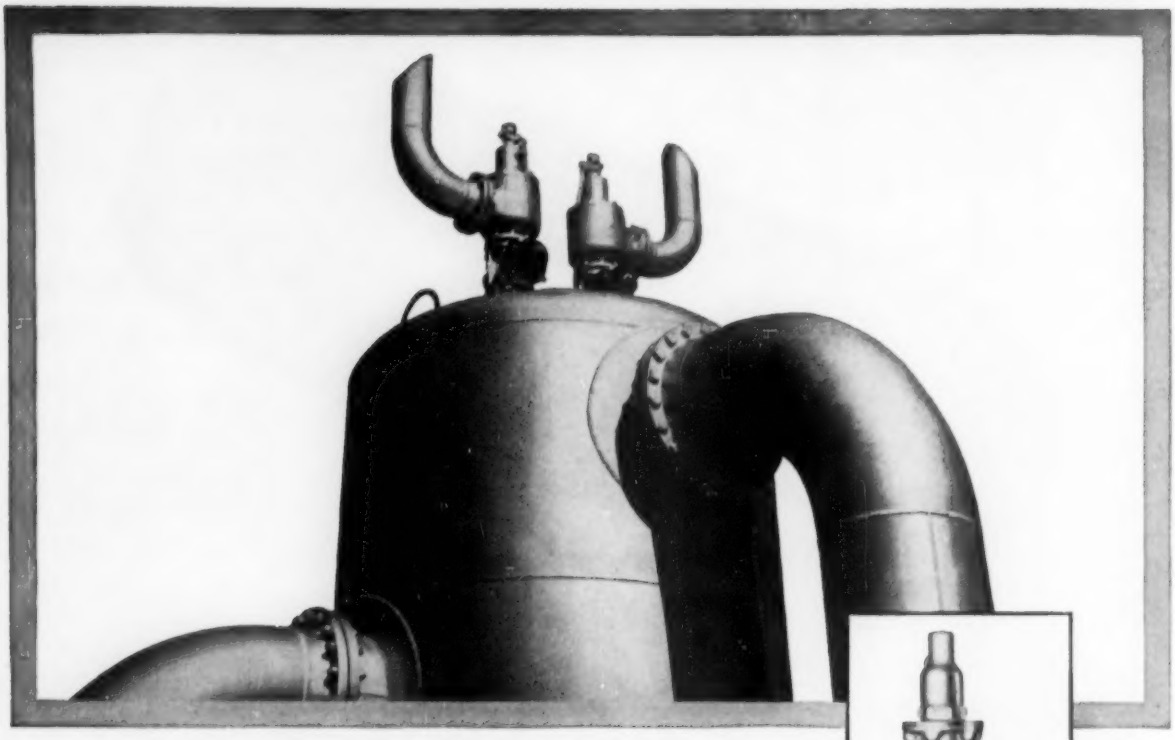

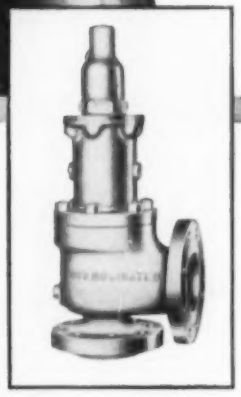

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

From Cloud No. 7

ARE there cobwebs on the suggestion box in your place? Could your outfit use some new ideas? Have you problems which seem to defy solution?

Try to "brainstorm" some original ideas. A lot of companies are doing it with pleasure and profit. Brainstorming isn't new; it's probably as old as civilization. The only new things are the name and the way it is taking hold in industry.

There are many ways to get ideas. One way is to let a "brain" concentrate until he gets a flash of genius, like when the apple fell on Sir Isaac Newton's noggin and he discovered gravity. Another way is to assign a team of researchers to work out a scientifically sound solution.

The goofiest way of all is brainstorming—but it works. Here's all you do: Get a bunch of people in a room, state the problem, and give them, say, 30 minutes to jot down or shout out any conceivable solution, no matter how crazy or impractical—just any old thing that happens to pop into their heads.

There's only one basic rule: No negative thinking. During a brainstorming session nobody is allowed to voice any criticism or objections. Every idea must be treated as constructive and worth study. There must be absolutely no evaluation or exercise of judgment. The chairman rings a bell or assesses a fine every time anybody raises the slightest objection to another fellow's idea.

Of course a lot of perfectly zany suggestions are made. Many of them you would immediately assign to "Cloud No. 7." But even the screwiest idea may stimulate the next guy into sparking a really brilliant approach. Success depends on an atmosphere of completely uninhibited group thinking.

In a wraps-off, free-wheeling, madcap session, with the green light on for wild imagination, ideas generate out of thin air. What's more important, ideas ricochet from one brain to another. They grow and improve as they get kicked around. Some fresh approaches are sure to be suggested.

The goal usually is to list 50 to 100 ideas at each session, and experience has shown that 6 to 10 per cent of them may be worth further study. But the sorting, analysis, and judgment must be done at a different time, and perhaps by a different group.

The basis of brainstorming is the simple psychological fact that imagination and judgment don't mix. The more objections we find to our own or another guy's ideas, the fewer new ideas are generated. Originality and evaluation require different environments.

You can buy books and training kits on brainstorming; you can hire demonstrators to show you how; you can read magazine articles on how many companies have profited from it. Or you can experiment yourself. Most concerns have worked out their own adaptations by trial and error.

Just follow this one basic principle: Remove every single barrier to uninhibited mental gymnastics, and you'll be surprised what really practical ideas can be pulled down out of Cloud No. 7.

Perish the Thought

AN idea, whether originated by brainstorming or otherwise, is a delicate, perishable thing. It can be blighted by the hot blast of an associate's scorn or the chill frost of a boss' scowl.

That's why ideas, both good and bad, should be nurtured, cultivated, and fertilized until their value can be measured, until the good ones are hardy enough to withstand the winds of evaluation and judgment.

In most organizations every new idea is met immediately with a dozen "killer phrases." Killer phrases? Here's some samples:

"That's ridiculous."

"We've never done that before."

"We tried that once."

"Has anyone else ever tried it?"

"It won't work here."

"It's too much work."

"Why stick our necks out?"

"Not practical."

"I don't like it."

Have expressions like that ever popped up in any of your conferences? You might amuse yourself by making a list of all the killer phases that could be used to cause a potentially good idea to die a-borning.

Henry D. Ralph.

Exactly Right!

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Thousands of BAKER CEMENT RETAINERS have been *successfully used* for placing cement, plastic, acid, or other fluids through tubing or drill pipe *at the place* where they will be *most effective*, behind the casing or liner; or *around the shoe*, or *into open hole* below the shoe. To be specific, Baker Cement Retainers are universally used for these important—and often troublesome—applications . . .

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Cast iron construction is recommended for *permanent* installations, or where harmful well fluids are present; Magnesium Alloy Retainers are available for *temporary* installations. Retainers constructed of either material drill up quickly and easily because of the minimum material to be disposed of, and because both the Body and Slips are designed to break up and drill out readily.

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Exactly right too . . . for the

WORLD'S DEEPEST SQUEEZE-CEMENT JOB:

21,639 ft.; 340°F. (approx.) 5,600 psi . .
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Richardson & Bass, Plaquemines Parish, Louisiana

SPEAKING OF RECORDS: A Baker RT Retrievable Cementer was also run and set for a successful squeeze in this same well at 21,470 ft.

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Why oil prices don't go up

WHY doesn't the oil industry raise its prices? Producers insist that crude sells below its replacement cost. Refiners and marketers contend that their margins are close to the ragged edge. Everybody is feeling increased operating costs.

Under similar conditions the price of almost any other commodity would go up. But not oil. Oil men are certain that tomorrow's oil will not be sufficient if today's price prevails, but they're doing little to change it.

The only plausible explanation is that the oil industry has a very unrealistic pricing system and pricing policy.

IN THE FIRST PLACE the industry is excessively timid. History has taught it, if not fear, at least a considered respect for government displeasure. Customer reaction, too, demands caution. Together, the two have "sicklied o'er with the pale cast of doubt" the countenance of what should be a determined oil industry. The industry is even hesitant to explain its position for fear it will be misunderstood.

It's a habit of negative thinking. Talk to any oil man and he'll give you a dozen hypothetical reasons why prices can't go up for every good reason why they should.

For example: There is general pessimism that products prices can't be raised enough to support a crude increase this summer because the 1-cent increase in gasoline tax under the new highway bill, it is argued, will raise gasoline prices as much as the public will tolerate.

IN THE SECOND PLACE, oil men too often tend to ignore the workings of supply and demand.

Individual action by 4 or 5 prorating states and by a dozen or 15 major refiners tips the balance between a glutted market where prices can't rise and a vigorous one where they can. But some of these, it appears, would rather sell more oil at prices they deplore than lay the groundwork for a better price structure by preventing an oversupply.

The urge to hold and expand gallonage by quickly meeting every price cut all too frequently takes precedence over the need for a firm general price structure. And the more cut-price products on the market, the harder it is for anybody to make a profit.

IT'S RIDICULOUS. Every segment of the industry says it must have higher prices to survive the long pull. Yet every segment blames some other segment for the condition, and waits for somebody else to make the first move toward correction.

The blame really lies with the whole industry's historic naivete toward prices—what makes them and what justifies them.

As long as the industry remains overly sensitive to possible criticism and temporary obstacles, and insufficiently sensitive to factors of supply and demand, it never will get oil prices on a realistic basis.

this is my hole card...

The first time I called Anchor I was needing a couple of cars of natural gasoline . . . fast! Anchor had those cars at my plant in record time. The smart way the Anchor team handled my order suggested to me that they might be the folks to not only supply the blenders I regularly need, but also to *market* my surplus petroleum products. So ever since, whether I've needed products or had products to sell, Anchor has been my "hole card" . . . always an Ace.

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Current and significant in . . .

The Industry This Week

Natural Gas

• **Orders for all the pipe** required by Trans-Canada have been placed. A $45-million order went to a Canadian firm and one for $32 million to a British maker. Earlier Trans-Canada placed a $35-million order with U. S. Steel. P. 74.

Lone Star is converting a multipay gas-distillate field in East Texas into the world's deepest and highest-pressure underground gas-storage project. P. 60.

Production

• **Louisiana's second cutback** in production in as many months is sparking a heated debate in the bayou country. The issue: Is Louisiana producing its fair share of the nation's oil? P. 58.

Crude production in the free world still grows. March production reached an all-time high of 14,982,900 bbl. daily. Areas outside the U. S. accounted for most of the increase. P. 75.

U. S. recoverable oil reserves total nearly 42 billion barrels, a study by an Interstate Oil Compact Commission group discloses. These include 29.6 billion barrels in primary reserves and 11.9 billion barrels of secondary reserves recoverable through fluid injection. P. 62.

Processing

• **Pressure among refiners** is building up for an early decision on how to number octanes above 100. An acceptable scale should emerge this summer. P. 68.

Bids will be taken soon on a 2,500-bbl. daily cat cracker at the new 10,000-bbl. refinery being built at Tacoma by U. S. Oil & Refining Co. P. 73.

Texaco expects the coming jet-fuel market to be tremendous. The firm is getting ready for its share by building the nation's largest privately financed jet-fuels laboratory. P. 72.

Exploration

• **A wildcat in the deepest** water yet probed off Louisiana has been spudded by the C.A.T.C. Group of companies. A novel "spraddle-legged" platform is being used in the 112-ft. deep water. P. 64.

Heavy crude has been found in Cuba at a wildcat 4 miles east of the small production on the north shore near Havana. California independent Ted Jones is the operator. P. 77.

Guatemala's first petroleum exploration concession has gone to Signal Exploration Co. The license covers 673,000 acres. P. 77.

Industry

• **A Russian-type turbodrill** may be produced in this country yet. Dresser Industries says it is manufacturing the drill on its own and also will work with France, which has acquired parts for the tool. Dresser moved after the Government rejected its deal to import the turbodrills from Russia in return for data on American rock bits. P. 66.

Jersey Standard appears ready to move into the Midwest market area. Jersey is buying Pate Oil Co., Milwaukee wholesale distributor. P. 70.

The multibillion-dollar highway bill has passed both Houses of Congress. Conferees will reconcile the two versions, both calling for a 40,000-mile superhighway network. The House voted $51½ billion, the Senate $37 billion. A penny increase in gasoline taxes will pay for most of the construction. P. 70.

Tempers rise as output drops; oil men ask . . .

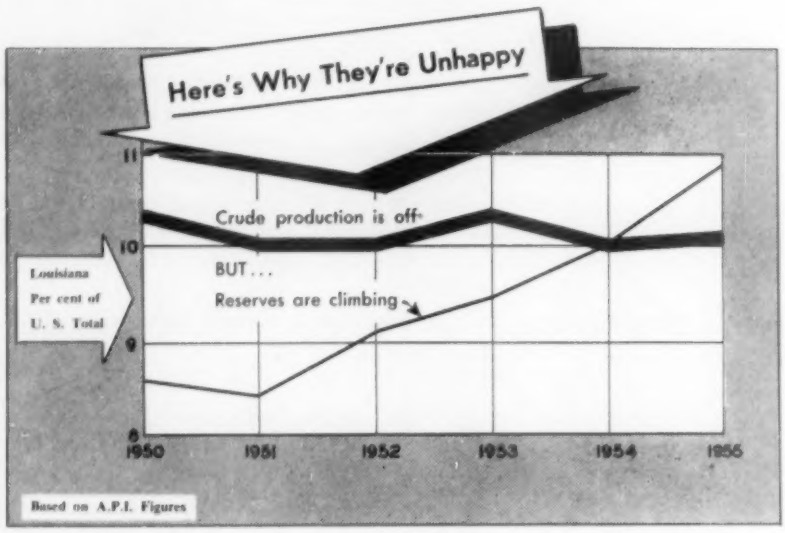
. . . Is Louisiana Producing Its Share?

BATON ROUGE.—Is Louisiana producing its fair share of oil?

This question is sparking heated debate in the bayou country. Temperature of the argument is likely to rise before the summer's over.

Louisiana oil men have been ordered to cut their production 2 months in a row as result of the seasonal drop in demand. Officials of the Louisiana Conservation Department warn that further cuts may be necessary before fall.

The department, together with oil-company representatives and royalty owners, is now trying to work out a new formula to distribute the cutback more equitably among state producers *(The Oil and Gas Journal, May 28, page 90)*. But John B. Hussey, state conservation commissioner, warns that a new allowable formula will not brighten the over-all picture for Louisiana crude producers. It may help some individual operators, but it will not raise the total allowable.



Cut to the bone . . . Hussey says the state allowable has been reduced "until I believe that we are reaching the economic minimum."

"Louisiana has cut production percentagewise more than any other state," says Hussey. "It's getting to the point where it's becoming critical."

Hussey, like most producers themselves, blames imported oil for forcing cutbacks in domestic crude output. But all admit that the imports problem is out of their hands and that little relief is in sight.

There has been a second, but less publicized, force holding down Louisiana production. That factor is domestic competition. In the past year or 18 months much of Louisiana's potential crude production has been crowded off the market by oil from other states. This has happened while the state's exploration and development were setting new records.

No place for oil . . . Demand for domestic crude simply has failed to keep pace with the growth in Louisiana's production capacity.

Some states with less successful exploration records have managed to boost production in relation to reserves while Louisiana failed to hold her own.

According to the American Petroleum Institute's annual estimates, Louisiana (including the offshore area) accounted for more than 65 per cent of the nation's net gain in crude reserves during 1955 *(The Oil and Gas Journal, March 19, page 123)*. Yet Louisiana got only about 11 per cent of the nation's production increase last year.

Since 1950 Louisiana's proved reserves of crude oil have increased 49 per cent. During the same period production has risen only 22.4 per cent.

In the past 5 years Louisiana's proved crude reserves have accounted for 22 per cent of the nation's net gain. However, the state's gain in production amounted to but slightly more than 9.4 per cent of the U. S. increase for 1955 as compared with 1950.

Adjustment period . . . These figures seem to indicate that Louisiana is producing far below her share of oil. But they do not tell the whole story.

Until about 18 months ago Louisiana had been depleting her oil reserves at a rate exceeding the national average (see chart). In 1950, for example, Louisiana had 8.6 per cent of the nation's proved crude reserves but accounted for more than 10 per cent of the production.

Successful exploration and rapid development of new fields brought the state's crude production and reserves into balance about 1954. Estimates of the A.P.I. placed Louisiana production and reserves both at about 10 per cent of the national totals at that time.

Since then, however, reserves have been added much faster than oil has been produced. The new production cutback which went into effect in May will increase that trend unless there's a sharp drop in discoveries.

Hussey says new wells are adding 10,000 to 15,000 bbl. to Louisiana's daily production each month. Since March 1953 production per well has been cut 58 per cent. But over-all output has soared to new highs. The June allowable for individual wells will be 60 per cent below the March 1953 figure. This means that a well producing 100 bbl. daily then will be allowed only 40 bbl. daily in June.

The June allowable was set at 737,499 bbl. daily—down 12,377 bbl. per day from the May total. The latest cut, although relatively small, followed a reduction of nearly 39,000 bbl. daily in the May allowable.

The Louisiana Department of Conservation maintained the same depth-bracket production formula from June 1955 through April this year. During that period daily crude production climbed more than 125,000 bbl. *(The Oil and Gas Journal, April 2, page 88)*.

A.P.I. figures for crude reserves and production do not reflect the large amount of condensate produced in Louisiana. The state has about 70,000 bbl. daily of condensate in its crude stream—more than any other state.

However, Louisiana's reserves-to-production ratio is even higher for total liquid hydrocarbons than for crude alone. A.P.I. figures show that Louisiana had 11.8 per cent of the nation's reserves of liquid hydrocarbons at the

How the Production and Reserves Picture Has Changed

CRUDE-OIL PRODUCTION*
(Thousands of barrels yearly)

	1950	Per cent of U. S.	1955	Per cent of U. S.	Per cent gain
United States	1,943,776	100.0	2,419,300	100.0	24.5
Louisiana	200,259	10.3	245,095	10.1	22.4
Texas	817,929	42.1	1,022,339	42.3	25.0
Oklahoma	163,867	8.4	200,799	8.3	22.5
Kansas	107,581	5.5	120,474	5.0	12.0
New Mexico	43,723	2.2	80,820	3.3	84.8
Colorado	23,088	1.2	52,836	2.2	128.8
Wyoming	60,620	3.1	98,970	4.1	63.3
California	327,607	16.9	354,812	14.7	8.3
Illinois	63,011	3.2	82,355	3.4	30.7

*A.P.I. crude only. Does not include any condensate.

PROVED CRUDE-OIL RESERVES*
(Thousands of barrels)

	1950	Per cent of U. S.	1955	Per cent of U. S.	Per cent gain
United States	25,268,398	100.0	30,012,170	100.0	18.8
Louisiana	2,185,137	8.6	3,255,287	10.8	49.0
Texas	13,581,642	53.7	14,933,502	49.7	9.9
Oklahoma	1,396,913	5.5	2,016,045	6.7	44.3
Kansas	732,187	2.9	998,068	3.3	36.3
New Mexico	591,982	2.3	819,658	2.7	38.4
Colorado	339,529	1.3	334,003	1.1	—1.6
Wyoming	841,016	3.3	1,373,630	4.6	63.3
California	3,733,562	14.8	3,801,408	12.7	1.8
Illinois	564,218	2.2	691,161	2.3	22.5

*A.P.I. crude only. Does not include any condensate.

RATIO OF CRUDE RESERVES TO ANNUAL PRODUCTION*

	1950	1955
United States	13.0	12.4
Louisiana	10.9	13.3
Texas	16.6	14.6
Oklahoma	8.5	10.0
Kansas	6.8	8.3
New Mexico	13.5	10.1
Colorado	14.7	6.3
Wyoming	13.9	13.9
California	11.4	10.7
Illinois	9.0	8.4

*Crude only. No condensate included in either reserves or production.

end of 1955 but produced only 10.4 per cent of the nation's total for the year.

What's to blame . . . Louisiana seems to be a victim of its own oil boom.

Contributing to its production cutback are numerous outside factors in addition to imports.

Development of new fields in the Rocky Mountain region, together with new pipeline outlets, has increased competition for domestic markets. Production has jumped, percentagewise, in some nonprorating states; but not in all.

Texas has increased its production in relation to known reserves. Crude output in Texas last year was 25 per cent greater than in 1950 while reserves were estimated to be only 9.9 per cent greater. From 1950 to 1955 Texas accounted for 28.5 per cent of the nation's net gain in crude reserves. Texas' production accounted for a major share—nearly 43 per cent—of the United States total increase for 1955 over 1950.

In 1950, Texas reserves were 16.6 times its annual production. The ratio last year dropped to an estimated 14.6 to 1.

Yet, Texas cannot be justly accused of grabbing more than its share of the domestic crude market. Despite the recent gain of production in relation to reserves, Texas is still producing more conservatively than any other major oil state.

Louisiana and Wyoming are the only other major producing states where the reserves-to-production ratio is higher than the national average of 12.4 (see table at left).

Oklahoma, Kansas, and Illinois are all producing crude at a higher-than-average rate in relation to reserves. But each of these states has a large number of stripper wells. And, in Kansas and Oklahoma, reserves are higher in relation to production than they were at the end of 1950.

Other states with an increasing spread between production and crude reserves are Colorado, New Mexico, and California.

Footage drilled . . . Louisiana producers appear to be at an even greater disadvantage when well depths are considered.

They customarily have to go deeper for oil than do their competitors in other states.

Of the 99 wells drilled below 15,000 ft. in this country last year, 70 were in Louisiana. More than 56 per cent of all United States wells drilled below 12,500 ft. last year were in Louisiana.

Total footage drilled in Louisiana in 1955 was about 79 per cent greater than the 1950 total. In the same interval the United States total rose slightly more than 42 per cent and the Texas total increased about 19 per cent.

In 1950 Louisiana accounted for 9.1 per cent of total footage drilled in the United States. Last year the percentage had risen to 11.5.

The boom continues . . . In speaking of Louisiana's oil boom, you are talking mostly of what's happening in South Louisiana. That's where most of the activity is, and that's where most of the oil is being found.

According to an annual survey by The Oil and Gas Journal, South Louisiana had 161 successful oil wildcats in 1955. This compares with 49 in 1950. The southern part of the state accounted for about 82 per cent of all oil discoveries completed in Louisiana last year. Output is running about the same percentagewise.

Wildcat activity has more than doubled in Louisiana since 1950. Total wildcat wells rose from 302 in 1950 to 695 last year. The success ratio also rose, with 23.8 per cent of the wildcats finding oil and gas in 1950 as compared to 32.8 per cent last year.

Despite stringent production controls, Louisiana's oil boom has shown no signs of a serious letup. During the first quarter of 1956 there were 54 oil and gas discoveries credited to Louisiana. This compares with 59 during the comparable period of 1955.

Lease Truce Asked

Louisiana given 7 days to reply in boundary dispute

WASHINGTON. — The Supreme Court last week gave Louisiana 7 days in which to reply to the Justice Department's motion for an injunction against efforts to deal with those boundary controversies in its state courts.

At the same time, the court asked both the department and the state to submit their views on maintaining the status quo pending final disposition of the Government's suit. The Government seeks to capture the state-claimed area between the 3-mile and the 3-league limit in the Gulf of Mexico.

Louisiana was ordered to file its reply to the motion by June 4. The time given was limited because the court expected to recess for the summer within the next 2 weeks. The suit to which the Justice Department objects is active in the state courts. Quick action is necessary if it is to be halted until the main suit is decided.

The state suit resulted in postponement of the Continental-Shelf lease sale planned by the Interior Department May 15. Atty. Gen. Herbert Brownell asked the high court late last month to order it held up *(The Oil and Gas Journal, May 28, page 95).*

Lone Star converting Tri-Cities into . . .

Deepest, Highest-Pressure Gas Storage

- Operating pressure of 3,200 psi. to be used in storing 35 billion cubic feet
- Besides storage, firm expects big recovery gains as a result of cycling

DALLAS.—Lone Star Gas Co. has started work to convert a multipay gas-distillate field in East Texas into the world's deepest and highest-pressure underground gas-storage project.

The field is Tri-Cities in Henderson County near Athens.

Lone Star will store up to 35 billion cubic feet of gas in two of the field's four pay horizons—the Bacon and Rodessa limestones. They are found at 7,800 and 8,200 ft. The Bacon, Lone Star figures, will hold about 20 to 25 billion cubic feet and the Rodessa about half as much.

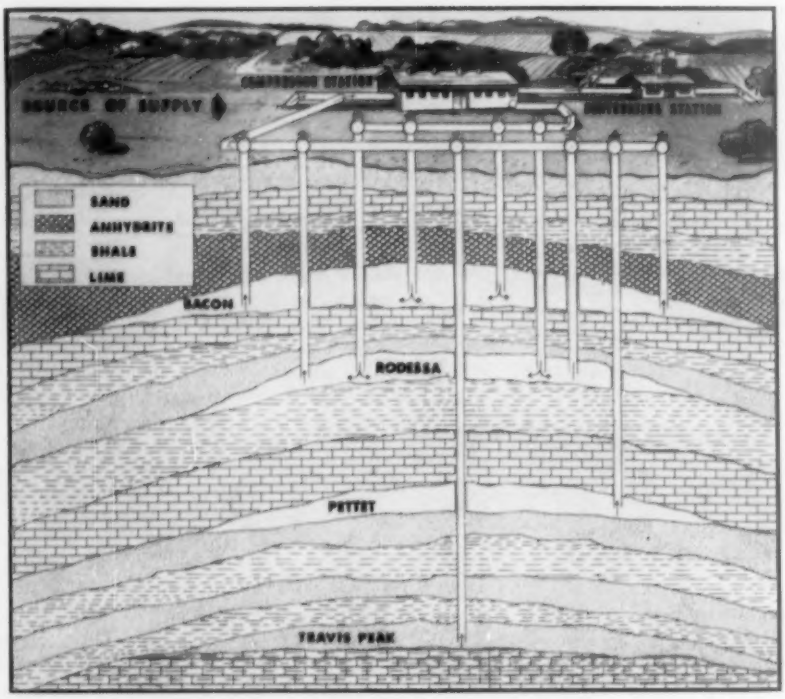
The two reservoirs will take this much gas at a planned operating pressure of 3,200 psi. This approximates original reservoir pressures.

Both the Bacon and Rodessa, discovered in 1941, are now virtually depleted. Bacon pressure now is down to about 150 psi. Pressure ranges from about 195 psi. to 600 psi. in the Rodessa.

By hiking present deflated pressure to the original figure, Lone Star expects to recover large added volumes of oil and condensate, too.

Both zones will be cycled during off-storage and off-withdrawal periods.

The company estimates that about 10 billion cubic feet of capacity will be cushion gas—with native gas accounting for about 3 billion cubic feet of this volume.



COMBINATION PROJECT will go into operation late this summer. It will not only store 35 billion cubic feet of gas, but will add measurably to total recovery from Tri-Cities field.

Plant started . . . A site for the compressor and dehydration plants already has been cleared. And engine blocks have been poured for the plant's three 1,350-hp. compressor units.

The initial station total of 4,050 hp. may ultimately be hiked by supercharging to 5,400 hp. The plant will inject up to 80,000,000 cu. ft. of gas daily from fields in the East-Central Texas area.

Remedial work on injection and withdrawal wells will start immediately. There now are 38 wells producing from the two pays. Six of these will become inputs—four in the Bacon and two in the Rodessa. Some of the remaining wells will be plugged, the rest used for withdrawal.

Lone Star expects to begin injecting storage gas late this summer or in early fall. Reservoir pressures will be built back up to original levels probably by early 1958.

Tri-Cities' other two pays are the Pettet lime topped at 8,500 ft. and the 8,800-ft. Travis Peak sand.

The Pettet is small and has only one well. It probably will be abandoned when depleted. The Travis Peak also is a one-well pool, but geology has indicated a sizable productive area. The sand will be further developed and operated on a gas-unit basis later on.

Biggest of four . . . Tri-Cities will be the largest such operation in Texas and second in the Southwest only to Oklahoma Natural Gas Co.'s 87 billion cubic foot project in Oklahoma.

The three other Lone Star operations have all been launched since 1950. They are in Leeray field, Stephens County; View field, Taylor County; and New York City field, Clay County. Capacities range from 3½ billion cubic feet at View field to slightly over 7 billion in Leeray. Capacity figures include cushion gas.

The Tri-Cities project closely resembles that already operating in New York City field. The latter, launched in August 1953, has been a whopping success not only from the storage standpoint but also in regard to added oil recovery.

New concept . . . The idea behind the project was the basis of a paper delivered at the recent American Gas Association meeting in Chicago. In it Bureau of Mines engineers concluded that more oil might be recovered from a depleted reservoir by a storage operation than via conventional gas cycling.

They suggested that such a gas-storage operation might recover almost as much oil as primary producing methods.

Both New York City and Tri-Cities are closed, anticlinal-type structures. View field also has come up with climbing oil production since gas-storage began. Oil production in March 1955 totaled 1,306 bbl. and has continued at a rate much higher than before it became a storage reservoir.

Computers Up Refinery Yields

Product quality raised, costs are cut by using machine which does work almost 100 times as fast as technician

TOLEDO. — Electronic computers have pointed the way to improved product quality and better yields in refinery operations of Standard Oil Co. (Ohio).

Savings resulting from computer calculations were outlined in two papers presented at a regional meeting of the Western Petroleum Refiners Association.

An I.B.M. 650 machine, in 61 hours, did one job that would have required an engineering assistant 6,000 hours (3 years). The problem was to arrive at the optimum operation of a gas plant at a refinery.

Calculations were made in two parts, first through the product-separator section and then through the rest of the plant, according to Mrs. Elsie D. Merrick of the process engineering division of Standard of Ohio. Analysis and programing took 425 man hours. Problem analysis required 19 per cent of the time, discussion and review 18 per cent, block diagram 6 per cent, coding 23 per cent, checking of routines 20 per cent, and program testing on I.B.M. machine 14 per cent.

I.B.M. results showed that product value would be increased by:

. . . **Decreasing the flash-drum** temperature in the gas-recovery unit.

. . . **Increasing the depropanizer** pressure.

. . . **Decreasing the propane** recycle rate.

A paper of K. E. Frye and K. L. Shull of Standard of Ohio explained the use of an inexpensive computer in planning gasoline blends.

The possible use of a CO boiler-type installation for cracking units was suggested in a paper by E. Durham and M. B. Leland of Babcock & Wilcox Co. The authors said the CO boiler has performed satisfactorily as a source of steam for refineries.

The boiler, it was explained, "is available to supply steam when the cracking unit is in operation with CO gas supplying its portion of fuel or when CO boiler is operated as a power boiler with only supplemental fuel."

G. F. Eisele and R. Smith reported the results at the Heath, Ohio, refinery of Pure Oil Co. in operating a reformer with the Sinclair-Baker catalyst.

The advantages in the operation of the turbocharged two-cycle gas engine were explained in a paper by C. A. Chamberlain of Clark Brothers Co.

New Interior Secretary Named

WASHINGTON. — Fred A. Seaton was nominated by President Eisenhower last week as the next Secretary of the Interior.

Seaton, a Nebraska newspaper publisher and radio and television-station operator, has served under the Eisenhower administration since 1953. Before that, he served a year in the Senate, to which he was appointed in 1951 after the death of Sen. Kenneth S. Wherry.

Under Eisenhower, Seaton served first as an assistant secretary of defense, then went to the White House where he has been a presidential assistant since February 1955. In his work there he gained some familiarity with Interior Department matters but has never had any direct connection with oil or other matters he will deal with as a cabinet member.

Surprise nominee . . . Seaton's nomination was a surprise. Several others, among them Undersecretary Clarence A. Davis, had been mentioned for the job. But Seaton is seen as more likely to win Senate confirmation than most other reported candidates.

Selection of a new secretary was a tough job for the president. Seaton's predecessor, Douglas McKay, was long under the fire of Congress for his alleged "give-away" policies on power, wildlife refuges, and public lands which the Democrats were expected to use as an issue in the coming campaign.

The "give-away" issue started with the tidelands oil legislation in 1953. Later it spread to McKay's policies on other matters. There was every indication the Democrats in the Senate would make a fight over the confirmation of any man suspected of holding the same views. Seaton, however, has not been involved in any of these controversies and Senate Democrats who could have opposed Eisenhower's nominee indicated they would vote for his confirmation.

Seaton was born in Washington, D. C., December 11, 1909. He is a graduate of Kansas State College and has been active in Republican politics since 1932.

Pipeline BRIEFS

BATON ROUGE. — The Louisiana House of Representatives is considering a proposed constitutional amendment which would create the post of Louisiana pipeline commissioner to regulate gas lines in the state.

The commissioner would be given the discretionary authority to charge a $1,000 fee for permits authorizing pipelines to cross state highways or public land. A companion bill would appropriate $75,000 to cover expenses of the office during its first fiscal year.

REGINA.—The Saskatchewan Oil and Gas Conservation Board June 15 will hear two applications for permission to build pipelines serving Dollard field in southwestern Saskatchewan.

South Saskatchewan Pipe Line Co. proposes to connect Dollard to existing lines leading to Regina. Royal Pipe Lines Co., Ltd., would connect the field with a gathering network supplying Interprovincial pipeline to the east.

WASHINGTON.—Texas Gas Trans-mission Corp. has applied for authority to construct facilities to increase deliveries in the southeast by more than 25,600,000 cu. ft. daily. Proposed construction would include about 36 miles of 30, 20, 16, and 6-in. line to service Louisville Gas & Electric Co., West Tennessee Gas Co., Gas Utilities Co., and Western Kentucky Gas Co.

WASHINGTON. — Piedmont Gas Co. is seeking permission to build a natural-gas system for supplying new areas in North Carolina. It would hook up with a Transcontinental Gas Pipe Line Corp. system. The new transmission system would include 78 miles of 8, 6, 4, 3, and 2-in. line extending generally northwest from Stanley to Morgantown and Lenoir. Estimated third-year peak day requirement is 5,953,000 cu. ft. daily. Some 5,500,000 cu. ft. daily would be supplied by Transcontinental.

WASHINGTON.—Oil movement by pipeline set a new quarterly record of 1,095,458,903 bbl. in the first 3 months of this year. It was the second consecutive quarter in which it topped the billion-barrel mark. The first quarter movement compared with 1,055,493,-003 bbl. in the preceding quarter and 977,777,188 bbl. in the first quarter of 1955, according to the Interstate Commerce Commission's periodic report.

All but 6 of the 67 pipelines reporting to the ICC showed an increase in volume over last year. But 10 of the companies reported a drop in transportation revenue.

Compact's Estimate of U. S. Oil Position

(Millions of barrels)

State—	1	2	3	4	5	6	7	8	9
New York	743	196	3	43	0	69	58	58	5.2
Pennsylvania	3,831	1,199	9	93	0	787	93	93	9.7
West Virginia	2,574	454	3	47	53	598	60	113	2.6
Kentucky	1,600	317	16	107	103	400	57	160	10.0
Ohio	4,450	639	4	56	53	175	11	64	6.2
Indiana	1,575	259	11	61	50	275	75	125	8.8
Illinois	7,000	1,837	82	691	400	3,000	1,500	1,900	4.3
Michigan	1,390	385	11	59	56	265	93	149	7.4
Kansas	14,075	2,708	120	998	900	350	125	1,025	11.7
Oklahoma	46,200	7,199	201	2,016	1,600	1,500	650	2,250	8.9
Arkansas	2,633	937	26	330	168	1,334	1,174	1,342	1.9
Mississippi	3,026	466	36	388	385	1,040	78	463	7.8
Louisiana	19,578	3,765	245	*3,255	3,367	4,307	1,938	5,305	4.6
Texas	99,850	18,923	1,022	*14,934	15,606	11,498	4,982	20,588	5.0
North Dakota	930	20	11	186	186	60	10	196	5.6
New Mexico	6,500	1,012	81	820	870	1,800	92	962	8.4
Colorado	3,047	342	53	334	300	600	100	400	13.2
Wyoming	10,100	1,326	99	1,374	1,300	975	290	1,590	6.2
Montana	2,248	227	15	300	353	117	29	382	3.9
California	56,800	10,410	355	*3,801	*3,801	3,600	‡529	4,330	8.2
Other states†	373	66	16	119	119	80	35	154	10.4
Total	288,523	52,687	2,419	30,012	29,670	32,830	11,979	41,649	5.8
Increase since January 1, 1954	16,590	4,870	§107	1,067	1,884	3,693	452	.....	.....

Identification of columns:

1—Estimate of original oil content of reservoirs.
2—Total oil production to January 1, 1956.
3—1955 oil production.
4—Proved reserves from A.P.I. news release, March 15, 1956.
5—Primary reserves as of January 1, 1956.
6—Estimate of maximum recovery obtainable by application of fluid injection methods.
7—Estimate of recovery from fluid injection under economic conditions existing as of January 1, 1956.
8—Combined primary and fluid injection reserves.
9—Per cent of reserve produced in 1955.

*Includes offshore reserves. †Includes Alabama, Arizona, Florida, Missouri, Nebraska, Nevada, South Dakota, Tennessee, Utah, and Virginia. ‡From National Stripper Well Survey, January 1, 1955. §Change from 1953 to 1955 production.

U. S. Reserves Set at 42 Billion Bbl.

DALLAS.—The nation's recoverable oil reserves total nearly 42 billion barrels, considerably more than previous estimates, the Interstate Oil Compact Commission was told last week.

This more favorable position results from phenomenal growth in the postwar years of fluid-injection projects.

Those are the significant conclusions from the second evaluation of United States oil resources made by members of the compact's secondary recovery and pressure maintenance committee.

Committee Chairman Paul D. Torrey announced results of the study last week. In brief it revealed:

. . . 29,670,000,000 bbl. of primary reserves on January 1, 1956.

. . . 11,979,000,000 bbl. of secondary reserves recoverable from fluid injection under present economic conditions.

These mean recoverable reserves of 41,649,000,000 bbl.

Trends shift . . . One interesting trend in the production picture was noted since mid-1955 when the first compact resources study was presented.

Since the first report, the estimate of primary reserves increased 1,884,000,000 bbl. Estimate of fluid-injection recovery only increased by 452,000,000 bbl. Thus the increase in fluid-injection reserves was considerably smaller than the primary-reserves increase.

This variation, Torrey reported, is believed caused by greater efficiency in primary-recovery practices. The recently discovered oil fields will be produced more efficiently than many of the older fields.

Role of injection . . . The important part that fluid injection will play in future oil production in various states is dramatically told in Columns 5 and 7 of the table.

Primary reserves of New York and Pennsylvania are considered negligible. This deficiency is made up by substantial fluid-injection reserves. In Illinois oil reserves that can be obtained by fluid injection are almost four times the primary reserve. In Arkansas the ratio is even higher.

Differences . . . The Torrey report noted that its estimated primary reserves are slightly smaller than estimates by the A.P.I. committee on proved reserves *(The Oil and Gas Journal, March 19, page 122).*

However, Torrey pointed out if his committee's primary reserves are added to its economically recoverable fluid-injection reserves, the total is considerably greater than the A.P.I. proved reserves.

The A.P.I.'s estimate on proved reserves was 30,012,000,000 bbl.

Torrey stressed that disagreement in the two estimates is not surprising and is no cause for concern. The Compact group takes the optimistic view, he said, that results have been obtained in hundreds of fluid-injection operations and are sufficiently dependable to be used as a pattern for making estimates.

The Compact report also pointed out that many state authorities give higher estimates on their individual reserves than the A.P.I. estimates. It points out that the A.P.I. often revises its estimates to take account of new discoveries or field extensions.

The Compact committee estimated the original content of known reserves at 288,523,000,000 bbl. with total oil production up to January 1, 1956, at 52,687,000,000 bbl.

Left in ground . . . The nation's oil operators eventually will probably produce only 94,336,000,000 bbl. or 32.7 per cent of the original oil in place.

This leaves 194,000,000,000 bbl. of oil that will not be recovered under existing conditions. The Torrey report declared this "presents a challenging problem from the standpoint of the tremendous energy potential involved, for the security of the nation, and because the production of oil contributes so much to the maintenance of government and to the comfort and welfare of the people."

Octanes Up Sharply

● Ethyl's survey for May shows premium climbs to 96.7, regular at 89.7

NEW YORK.—After showing little or no change during the late winter months, research-octane ratings on both regular and premium grade gasoline registered a sharp upturn in May.

Average ratings, weighted according to gallonage sold in 53 representative U. S. cities, stood at 96.7 RON for premium and 89.7 RON for regular, according to the monthly survey by Ethyl Corp. Tetraethyl lead contents also rose in both grades.

For the premium grade, the octane rise resulted from jumps in the upper range in several cities. A total of 38 such marketing centers showed average ratings of 96 RON or higher compared with only 29 in April. The Ethyl survey showed Buffalo with the highest average premium octane rating—98.0. Two Rocky Mountain cities, Denver and Salt Lake City, rated lowest with 92.6 RON.

Premium distribution by octane levels, follows:

PREMIUM

	May 1956	April 1956	May 1955
90-90.9	0	0	2
91-91.9	0	1	1
92-92.9	2	1	2
93-93.9	0	2	9
94-94.9	4	8	15
95-95.9	9	12	6
96-96.9	18	14	18
97-97.9	19	15	0
98-98.9	1	0	0
Total cities	53	53	53
Wtd. avg. RON	96.7	96.3	95.3
Wtd. avg. TEL ml./gal.	2.56	2.51	2.57

Regular grade showed a gradual upward shifting in octanes in the 87-92 RON range. Pittsburgh rated highest with 92.5 RON while Salt Lake City showed the lowest regular rating with 81.6 RON.

REGULAR

	May 1956	April 1956	May 1955
81-81.9	1	1	0
82-82.9	0	0	1
83-83.9	0	1	1
84-84.9	1	0	5
85-85.9	2	1	12
86-86.9	11	18	6
87-87.9	7	1	4
88-88.9	3	7	10
89-89.9	13	9	7
90-90.9	1	4	7
91-91.9	11	11	0
92-92.9	3	0	0
Total cities	53	53	53
Wtd. avg. RON	89.7	89.3	88.0
Wtd. avg. TEL ml./gal.	2.30	2.26	2.25

watching WASHINGTON

. . . with Bertram F. Linz

Congress faces decision on wartime laws . . .

THE Korean War is history but some of the wartime laws are still with us.

Over the next few weeks Congress must decide whether to extend any of these laws. It already has continued the wartime corporate tax rate and increases in the levies on gasoline and other items for another year.

The House last month voted to continue the export control act for another 2 years. The law is designed to prevent the communist countries from getting strategic materials, equipment, or technical data that will add to their military power. It was invoked recently to halt the export of data on rock bits in a deal by which Dresser Industries was to get some of the new Russian turbodrills.

The Defense Production Act also is to be extended. This provides the limited controls on steel, copper, and aluminum still on the books. Specified amounts of the three metals are set aside quarterly for military contractors and the strategic stockpile.

The DPA also is the law under which industry men are allowed to serve the Government without pay. It is the basis, too, of the expansion programs providing accelerated tax amortization for new plants in the oil and certain other industries.

Another bill continues for 1 year the authority of the military departments to build, expand, and convert private or public plants which may be needed for defense production.

The Renegotiation Act expires at the end of this year. It may be continued by action this session, or laid over until 1957 since it readily can be made retroactive.

You can throw away those records, now . . .

SPRING cleaning will take on added meaning for thousands of businesses this year.

The Government has said finally the wage and salary records which they have been keeping on file since 1950 can now be thrown out.

These records had to be retained under the Defense Production Act of 1950 in the event the Government wanted to see how employers complied with the rules of the wage and salary stabilization boards.

Coal interests oppose subsidized atomic development . . .

FIRST opposition to quick all-out development of industrial atomic energy is coming from the coal industry.

Oil men might be interested in the argument that an immediate switch to the atom is for the "have-not" nations.

The National Coal Association has no objection to orderly research and development of experimental atomic power plants. But it questions the wisdom of the socialistic program now before Congress to have the Government pay for a number of operating plants.

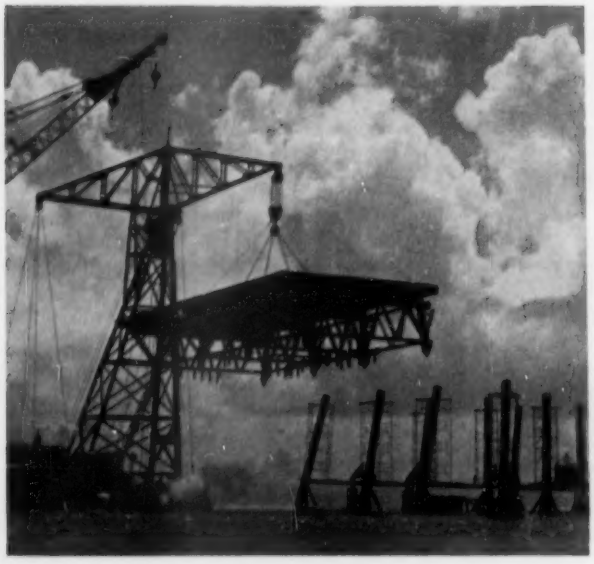
There is no need for a new source of power today, the association argues. The nuclear plants would be high-cost producers, with the taxpayers saddled with the bill.

Many nations are short of coal and have to depend largely on imported oil. They are the countries which need atomic power. The U. S. has enough coal to keep it going for a long time—and a lot of oil and gas. They will continue for years to be the low-cost fuel for power production.

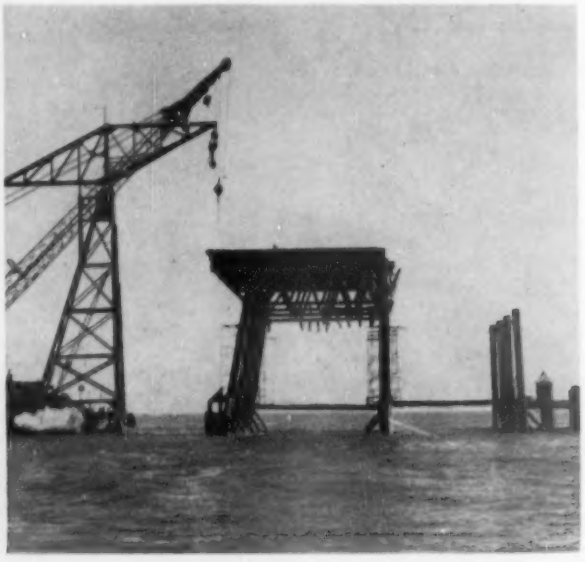
Aside from the unnecessary competition with present fuel industries and the cost to the taxpayers, the association has a third argument. Six atomic power plants in as many sections of the country would offer six terrific hazards, it warns. It would be well to learn more about the disaster potential before plants are built, rather than learn the hard way later, Congress was advised.

Platform substructure towed to sea . . .

where cranes tip it into position.



Platform deck is lifted over pilings . . .



then lowered into place high over water.

Deep-Water Giant Spuds First Test

HOUSTON.—The four-company C.A.T.C. Group of offshore operators last week spudded the first test in water 112 ft. deep—the deepest yet.

The wildcat will be drilled from the unusual platform pictured above, which was fabricated by Brown & Root, Inc., at Houston. The platform was moved more than 300 miles to location in Block 43, Grand Isle area, off the coast of Louisiana. The "spraddle-legged" platform was built in a special design to withstand high waves and 125-mile winds. Legs of the template and the pilings are slanted outward 1 ft. for each 6 ft. of depth. As a result, the template on which the platform rests is 56 ft. wider at the bottom than at the top.

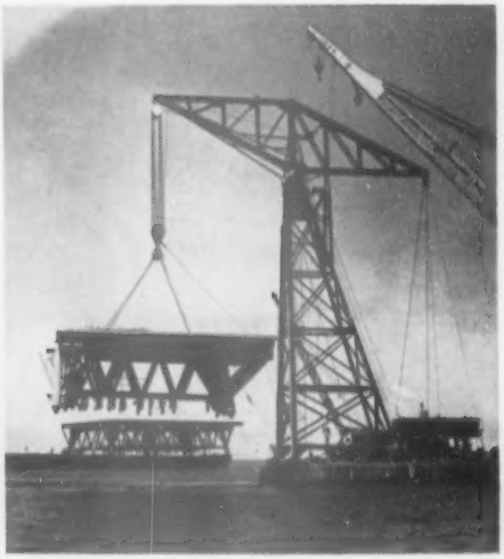
Sixteen pilings 260 ft. long were driven through the template legs and extend 108 ft. into the bottom of the gulf.

The pilings are 30 in. in diameter. Template legs are 33 in. in diameter and have ½-in. steel walls.

Deck of the platform is 55 ft. above the normal water level. Engineers who designed the structure say this would place it above the wave heights of any storm experienced in that section of the gulf during the past 100 years.

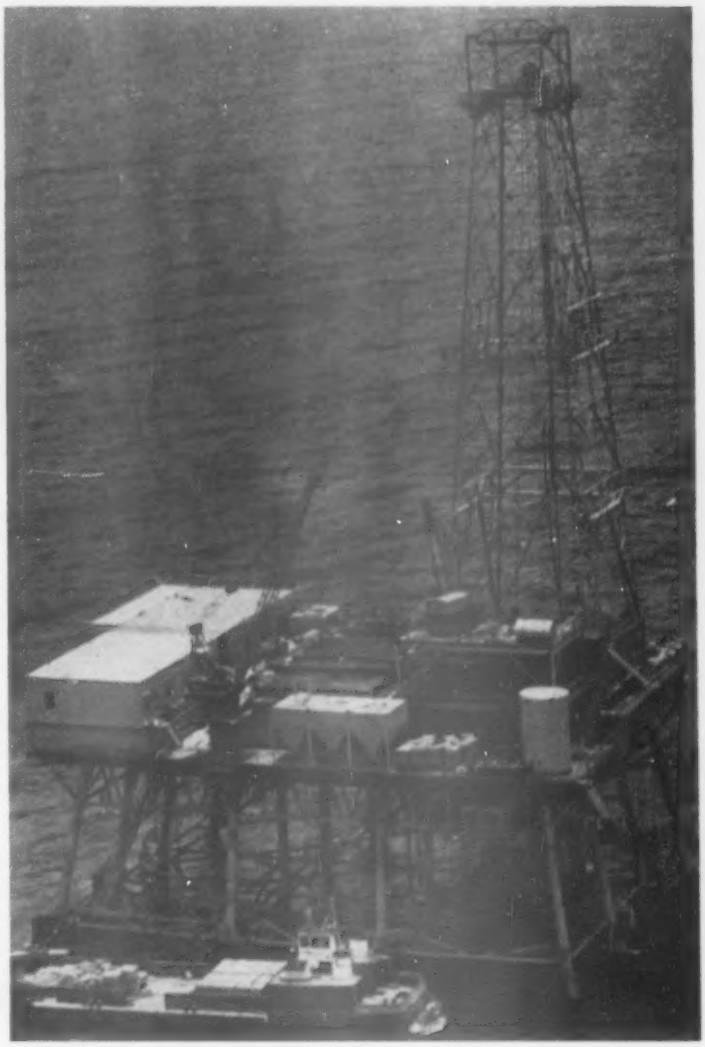
The entire unit is designed to withstand any storm of the severity experi-

With sections submerged and pilings driven . . .



cranes move in with decks.

After the platform was completed . . .



. . . A rig moved in to spud a wildcat

→

enced in at least the past 25 years. As an added precaution, vessels containing mud, water, and cement are so placed that they can be jettisoned in case of emergency. The platform was designed jointly by Brown & Root and the C.A.T.C. Group, which includes Continental Oil Co., Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.

Drilling equipment, housing units for 40 men, a helicopter landing deck, and other facilities have been installed since the $1,200,000 platform was erected.

The platform is equipped with a six-well Lee C. Moore derrick and a National 130, diesel-powered, drawworks capable of drilling to 16,000 ft. By skidding the rig 22½ ft., an additional six wells can be drilled from the new platform.

Dresser Making Own Turbodrill

TULSA.—The U. S. oil industry may soon have a Russian-type turbodrill in spite of the government's veto of a deal between the Soviets and Dresser Industries, Inc., Dallas.

J. B. O'Connor, Dresser executive vice president who went to Russia and arranged to import the heralded drill, said that his company is already manufacturing the tool. O'Connor (above photo) pointed out construction details last week to engineers and equipment men at a meeting of Tulsa Nomads, headed by Don L. Collins (seated), executive vice president, Republic Supply Co.

Dresser also will work with France to produce the turbodrill which Russia claims will make hole 10 times as fast as the U. S. rotary. "I expect to go to France soon in this connection," O'Connor said.

Dresser has the benefit of O'Connor's first-hand examination of the drill. He saw it perform in the field and came home convinced that the Russians had succeeded where U. S. engineers had failed in developing a drill that applies all the power where it does the most good—directly on the bit.

The turbodrill escapes the rotary's huge power loss through friction and avoids costly drill-pipe failures. The drill pipe does not rotate. Mud pumped down the stationary pipe spins the bit and lubricates the whole tool as well.

"The secret of success of the Russian turbodrill is in the use of rubber thrust bearings," O'Connor said. They hold the rotor shaft in place. American turbodrills have used a single steel bearing which wore out quickly.

Dresser had arranged to buy 40 Russian drills and manufacture them in the U. S. The Commerce Department said no because Russia was to receive data on U. S. rock bits in return. This was deemed to be a violation of the strategic Controls Act, although Dresser insisted Russia would not have received anything it did not already have *(The Oil and Gas Journal, May 21, page 139)*.

Atlas to Form Oil Company

TULSA.—Atlas Corp. plans to lump the oil and gas holdings of four subsidiaries into a new company called Petro-Atlas Corp. with headquarters in Tulsa.

Dale R. Snow, Tulsa consultant and former vice president of Sunray Oil Corp., now Sunray Mid-Continent Oil Co., will be chairman of the board. Tom Bolack, Farmington, N. M., will be president, and Fay Anderson, Tulsa, vice president. The firm also will have an office in Albuquerque.

Famed Case Revived

FPC to reopen hearings on gas rates of Phillips

WASHINGTON. — The 8 - year - old case which led to federal regulation of independent natural-gas producers was reviewed last week by the Federal Power Commission.

The FPC set June 26 as the starting date for hearings on the natural-gas rates of Phillips Petroleum Co. The inquiry also will cover price increases recently proposed by the company. They aggregate $2,300,000 a year to eight pipeline customers, now under suspension.

The investigation of Phillips' rates was initiated by the FPC October 29, 1948. It ended the proceedings August 22, 1951, with a finding that it did not have jurisdiction over the company under the Natural Gas Act.

The FPC's opinion later was reversed by the District of Columbia Court of Appeals. The reversal was affirmed by the U. S. Supreme Court June 7, 1954. The high court held the Natural Gas Act covered independent producers as well as pipelines, so far as the producers' interstate sales were concerned.

The FPC reinstituted the investigation November 22, 1954, in compliance with the Supreme Court opinion. No further action was taken, however, until last week.

The eight rate increases tagged on to the investigation involve sales to Michigan - Wisconsin Pipe Line Co., Northern Natural Gas Co., Cities Service Gas Co., Arkansas Louisiana Gas Co., El Paso Natural Gas Co., Consolidated Gas Utilities Corp., Trancontinental Gas Pipe Line Corp., and Mississippi River Fuel Corp.

Pipeline Controversy Grows

WASHINGTON.—Two more major gas pipeline companies opened fire last week on Midwestern Gas Transmission Co.'s plan for a 2,000-mile, $103,000,000 line between Portland, Tenn., and the Canadian border near Noyes, Minn.

Natural Gas Pipeline Co. of America and Texas Illinois Natural Gas Pipeline Co., both part of the Peoples Natural Gas Co. system, asked the Federal Power Commission to turn the project down.

They alleged it would have to depend on foreign supplies and asserted that approval would be in conflict with an FPC position taken in a prior case where this issue was involved.

Northern Natural Gas Co. filed such a motion last month *(The Oil and Gas Journal, May 28, page 100)*.

March Imports Dropped Slightly

TOTAL imports for March dropped below the average for February, but the decrease was due entirely to a reduction in receipts of residual fuel.

According to the regular tabulation of the Department of Commerce, March imports of residual fuel dropped 107,400 bbl. daily below the average for February, resulting in an over-all import decrease of 14,000 bbl. daily.

The following are some of the highlights of the March report:

...Crude from Canada set another all-time record with an average of 128,600 bbl. daily. Eleven new records have been set in the past 13 months. For the past 2 months, Canada has ranked second as a supplier of foreign crude for United States refineries, topped only by Venezuela.

...Crude from Iraq set a new record with an average of 38,000 bbl. daily. The previous high was in August 1955 when receipts reached 36,500 bbl. daily.

...Venezuelan crude averaged 410,000 bbl. daily, a decrease from February but exceeding the totals for 7 out of the last 10 months. The record for Venezuela was set last December with 492,300 bbl. daily.

...Imports from Kuwait increased 21,600 bbl. daily over February, but missed the all-time record of last June by 55,800 bbl. daily.

...Total crude imports for the month were 6.5 per cent above February and 13.5 per cent over March 1955.

...Reported crude does not include 24,455 bbl. daily from Venezuela for refineries in Puerto Rico.

...Total exports moved up 43,100 bbl. daily from the low record in February. Most of the gain was credited to crude and gasoline.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	Mar. 1956	Feb. 1956	Mar. 1955
Crude—			
Mexico	416	340	418
Colombia	576	610	829
Venezuela	12,723	12,295	14,597
Peru	124		125
Trinidad		97	
Kuwait	3,984	3,100	3,852
Saudi Arabia	2,614	2,867	2,697
Neutral Zone	161	286	219
Iraq	1,178	437	367
Iran	474	432	
Qatar	780	358	
Canada	3,986	3,269	929
Far East	963	482	624
Total crude	27,979	24,573	24,657
Daily average	903	847	795
Products—			
Residual fuel	13,502	15,745	16,105
Other products	2,356	1,173	1,620
Total products	15,858	16,918	17,725
Daily average	511	583	572
Total all oils	43,837	41,491	42,382
Daily average	1,414	1,430	1,367

EXPORTS*

	Mar. 1956	Feb. 1956	Mar. 1955
Crude	1,155	501	771
Gasoline	2,318	1,177	1,644
Kerosine	83	53	178
Distillate	1,561	1,650	1,515
Residual	1,284	1,269	2,255
Lube oils	1,127	928	1,191
Other products	1,004	1,154	1,074
Total all oils	8,532	6,732	8,628
Daily average	275	232	278

*Excludes shipments to territories.

Alabama to Try New Lease Sale

MONTGOMERY, Ala. — The Alabama Department of Conservation will try again to sell oil and gas leases on more than 300,000 acres of submerged lands which went begging at an earlier sale.

W. H. Drinkard, director of the department, has invited bids on 83 tracts underlying Mobile Bay, Mississippi Sound, and the Gulf of Mexico. Sealed bids will be opened here August 3.

Virtually all the land in the latest offering was put on the block at the state's last major lease auction in February. At that sale, the state accepted only eight bids covering a mere 37,516 acres out of more than 345,000 acres offered *(The Oil and Gas Journal, March 12, page 89)*.

The department did not disclose how many bids, if any, had been submitted for land offered but not leased in the February sale.

What's for sale . . . The August 3 offering covers primarily the odd-numbered tracts plotted under Mobile Bay, Mississippi Sound, and the Gulf of Mexico. Although the state claims jurisdiction over gulf tidelands more than 20 miles from its shore, all the land involved in the August sale will be within 9 miles of the coast line.

Approximately half of the total acreage offered is under the Gulf of Mexico. This portion of the offering is in 46 tracts covering 178,033 acres.

The Department of Conservation announced earlier that bids will be accepted July 2 for leases covering approximately 339,564 acres under the three salt-water bodies. This acreage includes most of the even-numbered tracts in those areas. It offsets land in the August offering on a checkerboard pattern.

Another sale . . . In a smaller lease sale announced last week the department will put 25,056 acres on the block.

This acreage, to be offered August 1, covers 12 submerged tracts in the Alabama Delta region.

Plant Sale Urged

Congress asked to approve deal for big rubber factory

WASHINGTON.—Despite some opposition, the Rubber Disposal Commission urged Congress last week to ratify the sale of the Government's big alcohol-butadiene plant at Louisville, Ky., to Union Carbide & Carbon Corp.

The commission pressed its recommendation in the face of objections by Attorney General Brownell that the sale would not tend to increase development of the synthetic rubber industry.

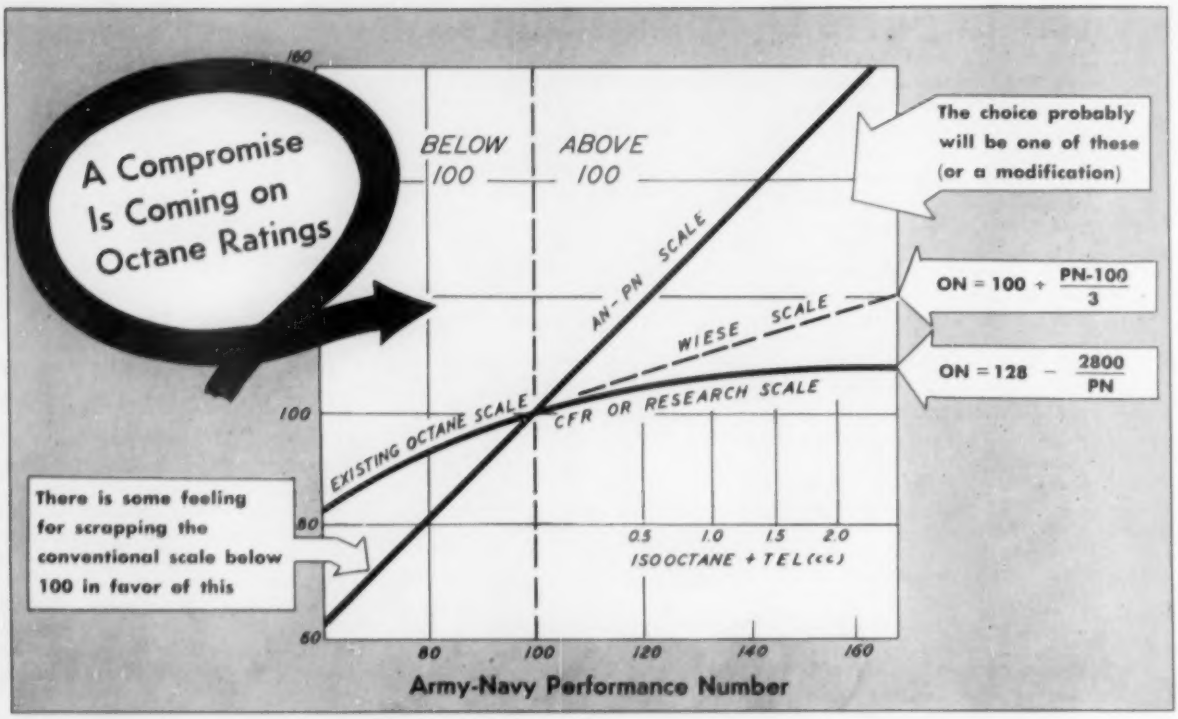
It was the first time Brownell had opposed the sale of a Government synthetic rubber plant. But in the sale of the 122,000-ton plant at Institute, W. Va., last January he gave his consent grudgingly. Had not the Government been involved, he is said to have commented, he would have turned the sale down as a violation of the antitrust laws.

The Rubber Disposal Act specifies that sale of the Government plants must result in the development of a competitive, privately owned synthetic rubber industry. Union Carbide reportedly does not plan to use butadiene from the Louisville plant for making synthetic rubber.

The commission, in its second attempt to sell the plant, received only two bids. Publicker Industries, Inc., which has a 3-year lease on the plant, offered $2,400,000. Union Carbide offered $3,125,000.

A spokesman for Publicker has attacked the disposal commission for not accepting an offer by Publicker to match Union Carbide's bid. He also claimed the commission's report to Congress recommending sale of the plant to Union Carbide was submitted without Justice Department approval.

The disposal act requires that the Attorney General report on the antitrust aspect of sales made by the commission. His report, however, is merely a legal opinion and of itself need not affect a sale. Congress has 30 days in which to disapprove the deal. If it does not act, the sale will become final automatically.


A Compromise Is Coming on Octane Ratings
BELOW 100
ABOVE 100
The choice probably will be one of these (or a modification)
AN-PN SCALE
WIESE SCALE
CFR OR RESEARCH SCALE
EXISTING OCTANE SCALE
ON = 100 + PN-100 / 3
ON = 128 − 2800 / PN
There is some feeling for scrapping the conventional scale below 100 in favor of this
0.5 1.0 1.5 2.0
ISOOCTANE + TEL(cc)
160
100
80
60
80 100 120 140 160
Army-Navy Performance Number

There's pressure for an early decision on . . .

. . . How to Number Octanes After 100

George H. Weber

NEW YORK.—When a refiner refers to a "105-octane" motor fuel, what exactly does he mean? There isn't any specific answer—yet. A yardstick for motor-gasoline antiknock quality above 100 research octane number is still in the talking stage.

But pressure is building for a decision. An acceptable scale should emerge early this summer from industry conferences this month.

A number of suggested scales have been under consideration for some time. Each has its advantages and its drawbacks. It is evident that no one scale is going to meet all requirements. But a compromise with perfection is in order and quickly, according to a consensus of those interested.

As matters now stand, the new scale will incorporate these factors:

. . . **Numbers above 100 research** still will be called octane numbers.

. . . **These numbers will relate** to engine performance.

. . . **Reference fuel will be** isooctane plus tetraethyl lead.

. . . **Discontinuity in passing through** the 100-research octane range will persist.

100 octane is here . . . The critical need for an official extension arises from the unexpected leap to 100-plus research-octane gasoline this spring.

Superpremium grades of this rating are now being marketed in a few selected Eastern and Gulf cities. Before the end of this motoring season it is possible that 100 research-octane gasoline will be available over much of the country.

Other problems . . . If the suggested scale extensions for octane numbers lack perfection, so do a number of other procedures concerning the rating of motor fuels of high antiknock quality.

As the quality improves, duplication of testing results becomes more difficult. There is a growing demand for more study in evaluating antiknock performance of motor fuels. So, the feeling seems to be one of settling this extension scale mattter and getting busy on other improvements which are equally, if not more important.

Innumerable panel discussions and working sessions on the octane scale extension have been held for the past several years. The area of disagreement is shrinking. Certain premises are being laid down which meet with general, if not unanimous, approval.

Reference fuel . . . In the first place, it appears that the matter of a reference fuel is nearing settlement.

In order to test antiknock quality, some point of reference is needed. In the range from 0 to 100 research octane, this reference fuel consists of the classic mixture of normal heptane and isooctane. This fuel will not serve above 100 because pure isooctane's research rating is 100. It is now generally agreed that this reference fuel mixture will be retained for ratings up to 100. Isooctane plus tetraethyl lead will serve as the reference fuel for rating above 100.

That done, there remains the problem of agreeing on what size octane numbers shall take above 100, or what yardstick will be applied to measure them.

Again, agreement apparently has been reached to call these numbers "octane numbers." Also, they should be proportional at least roughly to engine performance. That is, it should be possible to predict the power increase available from a fuel of a given octane number. Conversely, the octane number requirement of an engine with

a known performance should be calculable.

The joint session of the automotive research committee and the committee on petroleum products of the A.P.I. Refining Division held recently in Montreal clarified the situation to that extent. Some of the differences still existing may be resolved at meetings of the Coordinating Research Council and the American Society for Testing Materials in June. The latter is the body which will make the final and official decision.

The candidates . . . What are the possible scales from which to choose? Four are attracting the most attention. They are:

. . . AN-PN. When aviation gasoline ratings went above the 100 research mark, representatives of the military services, aircraft engine manufacturers, and the Petroleum Administration for War set about transforming milliliters of TEL in isooctane into a usable set of numbers.

Out of this came the original performance-number curve. It approximated a scattering of data showing percentage increase in aircraft engine power for various increments of TEL in isooctane. This curve was later altered to give smooth values and become the official basis for AN-PN scale.

This scale cannot be used to calculate automatic performance of a particular fuel in specific cases. But it does show a general relationship between perfomance numbers, and engine output. (All performance numbers are of equal size, and are much smaller than research octane numbers in the range of 100).

When the AN-PN scale is added to the research octane number curve a sharp break occurs at the 100 point. This makes it impossible to use AN-PN and RON blending values of fuel components above and below 100 in arriving at predicted ratings of a gasoline composite.

An attempt to solve this discontinuity was made in extrapolating the performance-number curve below 100. This scale can be related to octane numbers by calculation, but it has seen limited acceptance and was not used in any fuel or engine specifications. So, the AN-PN scale was retained above 100 and the RON scale below 100 for aviation gasoline. These performance numbers are often called octane numbers.

. . . AN-PN modifications. The advantage of their uniform size and approximate correlation to engine performance makes performance numbers a prime candidate for acceptance above 100. But the discontinuity feature is disliked by many.

Hence, some modifications have been recommended which will alleviate the break at 100.

One such suggested scale is proposed by Wiese of General Motors Corp. and is known as the Wiese Scale. His formula for numbers above 100:

$$ON = 100 + \frac{PN-100}{3}$$

This retains the advantages of the AN-PN scale but makes numbers larger. It modifies but does not eliminate the break at 100, as shown by the chart.

Octane numbers on the Wiese scale are equal in size to the research octane number at 97.5, making the slope of the Wiese line parallel to the research-octane curve at 97.5. Since the higher research-octane numbers to 100 grow considerably in size, some shrinkage still occurs at 100 when going over to the Wiese scale. This could still cause trouble in trying to use the two scales for blending gasoline in the critical 100 RON range.

. . . New scale below 100. There are some who favor abandoning the research-octane scale below 100. They want to adopt the AN-PN scale or modifications of it throughout the range embracing 80 or 90 RON to the limit represented by isooctane plus 6 ml. TEL.

These recommendations stress the advantages of continuity throughout the octane ranges which will be in use both now and in the indefinite future. The disadvantage of these plans entails the rescaling of octanes as they have been measured since 1930. If the AN-PN extrapolation below 100 were adopted as such, the shrinkage of research numbers would greatly alter the scale. It would mean a revision of octanes as we know them. Performance numbers of 90 and 95 correspond roughly to research octane numbers of 75 and 85.

. . . RON extension. The conventional research octane number system can be extended through 100. Numbers above that point would be derived by the following formula:

$$ON = 128 - \frac{2800}{PN}$$

This scale, commonly termed the CFR extension, shows no discontinuity in passing through 100. But octane units become increasingly larger. The terminal number representing isooctane plus 6 ml. TEL stands at only 110.6 as compared with a PN of 161 and a Wiese octane number of 120.

If this scale were adopted, increments of as little as one-tenth of an octane number would loom important in relation to engine performance. Even though continuity is retained through 100, blending values are not linear, and the actual measurement of octane numbers on this scale is open to question.

Who wants what? . . . With these recommended scales to consider, an indication of the trend in thinking can be determined by reviewing the stands of various parties interested in extending the octane scale.

The automotive companies would like to have the extended scale show some relationship to knock-limited compression ratio and engine performance. Two of the three major companies have been using the AN-PN scale both above and below 100 and would favor switching to this scale all along the line. The third company is emphatically opposed to scrapping the research scale below 100, and favors the Wiese scale above that point.

Detroit recognizes, however, that the scale extension has its greatest implications to the petroleum industry and will go along with that industry on its choice. If the research scale is to be obtained below 100, two of the three auto manufacturers would like to see the AN-PN scale adopted above that point. But both would agree to compromise on the Wiese scale suggested by the third company.

On the petroleum side, refiners would like to adopt a scale whose numbers more directly reflected manufacturing costs. In this respect both the CFR extension and the Wiese scale show rapidly rising costs per octane number per barrel at progressively higher quality levels.

An example is cited with costs based on increasing the octane level of the total gasoline pool maintaining regular grade 7 ON F-1 below premium. On this basis, using the Wiese scale and the CFR or research octane extension, the cost per octane number per barrel of total gasoline stands at 3 cents when premium rating is fixed at 96 RON. This cost factor rises to 15 and 20 cents per barrel for each octane number increase in the 100-number range for premium gasoline.

A more uniform cost factor results when using the AN-PN scale. From a purely technical standpoint, the AN-PN scale has merit above 100. If it were adopted, technical personnel undoubtedly would adapt their thinking to the AN-PN scale below 100 as well. While numbers would still be called octanes, this could result in a double standard below 100 causing some confusion. While the public has a general idea that octane numbers as we know them are near 100 for premium grade gasoline, few if any companies have ever advertised octane numbers as such.

Socony's Big Cat Reformer on Stream

PAULSBORO, N. J.—Socony Mobil Oil Co., Inc., has just commissioned its largest catalytic reformer here.

The 20,000-bbl. per calendar day unit shown in the foreground is capable of upgrading heavy naphthas into gasoline with antiknock quality of 100 RON plus.

The unit employs Socony's process, which originally was called Sovaforming. It contains more than a million dollars worth of alumina-type catalyst impregnated with platinum. This catalytic reforming catalyst, produced by Baker & Co., Inc. is also used in Sinclair-Baker and other reforming units.

This photo shows the feed preheater and intermediate heating units on the right and fractionation and stabilization facilities to the left. The unit includes hydrogen-treating facilities to reduce sulfur from feedstock. In the background are Socony's two T.C.C. units.

Socony will place another similar catalytic reformer on stream at the East Chicago, Ind., refinery within a few days. This 9,000-bbl. per day unit will be the fourth of its type, including two operating units at Socony's Augusta, Kans., refinery and affiliated General Petroleum Corp.'s new Ferndale, Wash., refinery. Two more 9,000-bbl. per day units are nearing completion. They are slated for initial operation about July 1 at Trenton, Mich., and August 1 at Buffalo.

Jersey Buying Midwest Jobber

NEW YORK.—Standard Oil Co. (N. J.) last week appeared on the verge of extending its marketing operations into the Midwest.

Negotiations were nearing completion for the purchase by the Jersey organization of Pate Oil Co., Milwaukee wholesale distributor. An announcement is expected early this week.

Pate operates 130 service stations in the Milwaukee area. It distributes gasoline in eastern Wisconsin and fuel oil in a four-state area. It has two large terminals with total storage of about 4,000,000 gal. Pate also blends lube oils and distributes them in a three-state area.

The Pate purchase is thought by some to be Jersey's first move in an effort to extend its marketing through the North Central United States.

Jersey also is understood to be interested in International Refineries, Inc., which operates a 12,000-bbl. refinery at Wrenshall, Minn.

If Jersey should break into the Milwaukee marketing field, it would have to use a brand name other than "Esso," since this is Standard Oil Co. (Ind.) territory.

Indiana Standard in 1938 won exclusive rights to the "Standard Oil" designation in its area of operation. A circuit court decision in St. Louis upheld a trial-court ruling that "Esso" was a commonly used abbreviation of Standard Oil and that its use by another company would infringe upon the rights of Indiana Standard.

Road Bill Passed

Conference committee will adjust different versions

WASHINGTON.—The nation is assured its biggest highway-building program in history, and it will be financed primarily by a penny increase in the 2-cent federal gasoline tax.

The Senate passed its version of the highway bill last week, retaining a House provision for the 40,000-mile interstate network of superhighways. The federal Government will pay $25 billion of this cost, with the states supplying $2 billion.

Both versions adopted the new principal that highway-user taxes, not general revenue, will bear the entire cost. But conferees must adjust several differences in the bills.

The House voted for $51½ billion in federal-state construction over a 13-year period *(The Oil and Gas Journal, May 21, page 122)*. The Senate approved $37 billion, with allocations for the rest of the federal-aid system, apart from the expressways, to run 5 years. The House called for a 13-year program for the entire system.

The bills also carry different bases for deciding where the money will be spent.

Wyoming Sweet Crude Cut

Stanolind Oil Purchasing Co. last week announced adjustments in sweet-crude prices in Wyoming effective June 1, 1956.

The change is a reduction of 7 cents a barrel for all sweet-crude fields for which the company posts prices except Beaver Creek (Madison and Tensleep) and Riverton Dome.

The new postings bring field prices in line with net-back prices posted for Denver-Julesburg basin fields early this year. The schedule starts with $2.41 for crude below 20° gravity, with normal gravity change of 2 cents per degree to $2.83 for 40° gravity and above.

At the time of the posting for the Denver - Julesburg area, the top of $2.83 was set as the price that would make the crude competitive in the Chicago area with crude from the Mid-Continent.

Industry estimates of breakdown of Wyoming production show about 90,000 bbl. daily of sweet crude out of a total of about 285,000 bbl. daily.

Uniform Controls Sought

Compact regulatory-practices group says same procedure in all states would save oil companies money, manpower

DALLAS.—The Interstate Oil Compact Commission is making progress in a move to standardize well tests and other regulatory practices of various state agencies.

This was revealed last week when the regulatory-practices committee of the compact accepted enthusiastically a report from a study committee headed by O. P. Nicola, Jr., of Phillips Petroleum Co.

Nicola pointed out a number of procedures where state regulations differ for no good reason. He said a degree of uniformity would save the oil and gas industry much money and manpower. It might also save money for the state agencies without impairing their necessary control over the industry, he added.

The confusion . . . This need was echoed by a number of industry representatives attending the compact sessions here.

Gas engineers, particularly, endorsed the idea of uniform practices. They declared that crews must be taught four different methods of measuring gas-well potentials in Texas, New Mexico, Oklahoma, and Kansas. Results of the four methods are so different that they are of little use to the operators.

State officials expressed a willingness to review their control and reporting methods and to unify and simplify them wherever possible. They asked the committee to continue its study and to bring in definite recommendations at the December meeting.

Common ground . . . Nicola's committee compared the reporting practices of 31 states and two Canadian provinces. Areas of agreement and disagreement were grouped.

In only a few cases, it was found, are the methods and report forms prescribed by state legislation. In general the regulatory bodies are free to change their methods by administrative action.

Areas where the study committee suggested uniform practice included:

. . . Detailed control of oil. In Texas every barrel is followed by tenders. Other states rely on reports of refiners, transporters, and bulk storers.

. . . Distributing allowables to wells.

. . . Minimum allowables and treatment of stripper and marginal wells.

. . . Production reports—required by most states from the producer but by Oklahoma from the purchasers.

. . . Multiple completions and disposal of salt water.

. . . Gas-well practices — such as standardized potential tests, new test methods for condensate wells, standard pressure base, and definition of gas wells.

. . . Work reports on wells. These involve much paperwork in some states while in others a single completion reports covers all essential information.

Big Line Approved

Two California utilities get permit for new 30-in. job

LOS ANGELES. — Two California utilities have received the go-ahead for construction of another big-inch line to handle increased imports of natural gas to Southern California.

The State Public Utilities Commission approved the application of Southern California Gas Co. and Southern Counties Gas Co. to boost their imports of gas from El Paso Natural Gas Co. an additional 328,800 M.c.f. daily. In order to handle this increase, approval also was granted the two companies for the construction of a 236-mile, 30-in. line from Topock, Ariz., to Newhall, Calif.

The utilities will build a 41-mile, 30-in. line from Newhall, on the north outskirts of Los Angeles, to Alhambra on the east side of the city, to handle distribution to Los Angeles basin customers. This line did not require commission approval.

Construction on the $26,963,000 Topock-Newhall system will begin in November. Work on the $7,100,000 Newhall-Alhambra line will start in early June. No contracts have been awarded.

Sarnia Refinery Expands

SARNIA, Ontario.—Canadian Oil Refineries, Ltd., will put new units on stream June 4 to increase capacity of its 2,500-bbl. refinery here.

The units will add 5,000 bbl. to basic crude capacity, 1,500 bbl. to catalytic cracking capacity (40 per cent recycle), 2,500 bbl. to vacuum capacity, and 500 bbl. to Platformer capacity.

Crude deliveries to the refinery are expected to run about 27,000 bbl. a day for the rest of the year. All will be moved through the Interprovincial Pipe Line.

The company is planning further expansions, with construction to start in September on a 3,650-bbl. Udex extraction unit and a 4,400-bbl. Platformer. They will produce benzene, toluene, and xylene. Completion is expected in August 1957.

Union Seeks Vote

Seafarers still trying to organize offshore crews

NEW ORLEANS.—The National Labor Relations Board has set a hearing June 19 on a petition by Seafarers International Union of North America, which is seeking to represent certain seagoing employes of The California Co.

The union has requested an election to determine representation rights among company employes on six converted LST's and 11 motor vessels used in offshore oil operations.

This is the second attempt by the union to organize personnel involved in offshore work.

In April an election was held among employes of Tidelands Marine Service Co. Fifty-three ballots were cast for the Seafarers Union, 7 for National Maritime Union, and 50 for no union. An additional 16 ballots were challenged. Also a charge of unfair labor practices filed against the company by the Seafarers Union is now pending before NLRB.

Lindsey J. Williams, New Orleans port agent for S.I.U., said the union is not seeking jurisdiction over drillers or roughnecks. The union is trying to organize seamen who work on deck or in the engine rooms and stewards.

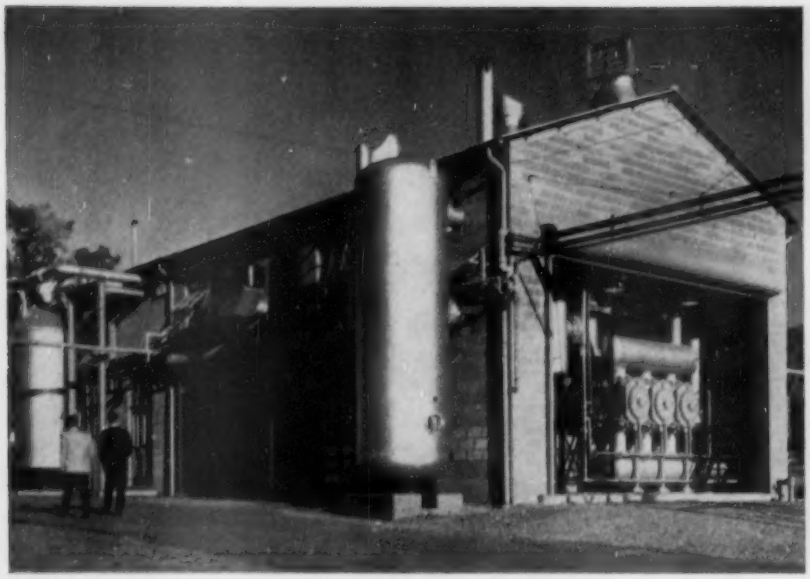
The National Maritime Union, another A.F.L.-C.I.O. organization, was voted down in March when it sought to organize certain seagoing personnel of Penrod Drilling Co.

Cities Service Ends Curbs

BARTLESVILLE, Okla.—Cities Service Oil Co. restored its purchases of crude oil to 100 per cent of allowables in five states effective last Friday. Purchases had been prorated since the company's East Chicago refinery was shut down by strike April 3.

Cities Service officials announced here last week they had advised state regulatory bodies of the resumed purchases in Kansas, Louisiana, New Mexico, Oklahoma, and Texas.

The refinery is still shut down by the strike with prospects none too bright for an early settlement. The dispute between management and a local of the Oil, Chemical and Atomic Workers International Union originally involved seniority rights.



JET-FUELS LAB of The Texas Co. is largest ever financed privately. Tall tank at left preheats air to maximum of 800° F. Tower in center is a surge tank for removing pulsations in flow from air compressor seen through open end of the building.

TEST RUN on combustor section of commercial turboprop engine sets exhaust pipe flowing from intense heat.

New Texaco lab points up trend . . .

. . . Jet-Fuel Market Will Be King Size

BEACON, N. Y.—The Texas Co. has just finished the nation's largest privately financed jet-fuels laboratory at its principal research center here. The $250,000 lab took a year to build and is believed to be the only oil-company installation capable of testing jet fuels in full-scale combustors.

The main two-story building contains two test cells. One for high-pressure testing is equipped with one combustor stand. The other, to be used for medium pressure and vacuum work, has one burner stand now and is designed to take a second one later.

Texaco expects that domestic airlines alone will need 1.1 billion gallons of jet fuel per year by 1962. This estimate is borne out in discussions on the jet age at the midyear meeting of the A.P.I. Division of Marketing in Atlanta.

Commercial craft are already becoming a factor in jet-fuel demand. Vickers Viscount turboprops are already in wide usage by two airlines serving U. S. cities, and 143 more are on order. They will be followed shortly by the Bristol Brittania, the Lockheed Electra, and possibly other turboprops.

By 1959, when the turbojet Boeing 707 and the Douglas DC-8 become available, the jet age for commercial flying will have arrived in full force.

In the next 4 years, commercial and military needs for jet fuel will rise an estimated 50 per cent, and will double by 1965, according to a panel discussing the subject at the A.P.I. meeting. During the same period, aviation gasoline needs will continue strong.

Avgas future . . . In the free world, military, commercial, and private aircraft used 287,000 bbl. of gasoline per day last year. On order are 350 more piston engine planes. These gasoline-consuming craft will still play a big role in the expected increase in air traffic during the next 6 years.

Additional airline consumption of aviation gasoline will more than offset the loss in military volume, and the avgas market is expected to hold at about the 1956 level up to 1965.

Meanwhile, jet fuels will come strongly into the demand picture.

In the beginning Texaco expects that the commercial airlines may favor the kerosine type fuels over JP-3 in the transitional turboprops. But as both commercial and military demands grow, there will not be enough kerosine to go around, and some other type of fuel will be required.

What is planned . . . Texaco has been testing jet fuels in combustors here for 10 years. The company has evaluated many fuels—unleaded gasoline, kerosine, furnace, and diesel fuels.

With its new laboratory, it feels well equipped to participate in further research on future jet fuels. It is already working with airframe and engine manufacturers and the airlines on a program to establish the optimum fuel for commercial jet operation.

Problems to be faced in this program include burning characteristics, combustion deposits, thermal stability, smoking tendencies, and flame radiation. These studies require full-scale installations. With its ability to duplicate aircraft gas turbine operating conditions at speeds of over 1,000 m.p.h. and altitudes up to 100,000 ft., Texaco feels ready to take a major part in the development and testing of jet fuels of the future, whatever they may be.

Imperial Studies Ethylene

SARNIA, Ont.—Imperial Oil, Ltd., is considering building a $10-million plant near its refining center here to manufacture ethylene. The new plant would use hydrocarbon raw materials from the refinery gas streams.

Imperial reportedly does not plan to process the ethylene into any intermediate or end products but would sell it in gas form to chemical industries.

Imperial already has made plans for a $3.8-million plant here to make detergent alkylate.

Employe Ideas Pay Off

W.P.R.A. hears how Socony Mobil profited from employe suggestions during 25 years program has been operating

TOLEDO.—An employes' suggestion program can be a gold mine of ideas for oil companies.

If properly directed, it will produce information not obtainable from any other source and will result in important cost reductions.

This has been the experience of Socony Mobil Oil Co., Inc., whose national suggestion system is coordinated by W. S. Wilcox. He presented the results of Socony Mobil's 25-year-old program at a regional meeting of the Western Petroleum Refiners Association May 24 and 25.

The 2-day session was devoted to industrial relations and technical subjects. It was attended for the most part by refinery representatives from Ohio, Indiana, and Michigan.

Socony's program . . . About 40,000 suggestions have been received by Socony Mobil companies during the past 7 years, Wilcox reported.

A total of $250,000 has been paid for ideas accepted. Individual awards have run as high as $3,500. Several payments of $1,000 have been made.

The program has cost more than $1,000,000. But an audit reveals substantial profits have been realized. The costs included the time of executives, award committees, and all employes who aid in carrying out program details.

Socony Mobil started seeking employe suggestions in 1930. During the next 16 years, Wilcox said, 1,919 suggestions were received. The company paid $13,000 for the 979 which were accepted.

Early troubles . . . At the end of this period management wasn't satisfied with the results.

The board of directors ordered an 18-month study of other programs to find what was wrong. It was learned that where failures occurred there were generally four main reasons:

. . . Not enough support from management.

. . . Too much time taken to process suggestions, usually 11 months.

. . . Rewards too low. Prizes of $5 and $10 offer little incentive.

. . . Promotion was sporadic.

Socony corrected these weaknesses. Now the smallest award is 10 per cent of the first year's savings effected by the suggestion. Management support was enlisted. Processing time was greatly reduced. And promotion of the plan under Wilcox's department was made continuous.

The coordination department itself is small. Whether an affiliated company or major department adopts the suggestion program is left to individual management, Wilcox said. Some foreign subsidiaries also have been sold on it. Individual units decide on awards and are largely responsible for making the program effective.

Refinery Going Up

Bids ready soon for cat cracker at Tacoma plant

LOS ANGELES.—U. S. Oil & Refining Co. will advertise for bids soon on building a 2,500-bbl. daily catalytic cracker at its 10,000-bbl. refinery under construction at Tacoma, Wash.

Units now being built include a topping unit, a three-stage vacuum still, and a thermal cracker. U. S. Oil & Refining expects to put these units on stream early in December.

The company recently signed a contract with Socony Mobil Oil Co., Inc., calling for delivery of up to 10,500 bbl. of crude daily through Socony's West Coast affiliate, General Petroleum Corp. Under terms of the agreement the crude can be supplied by General Petroleum from Venezuela, Canada, Middle East, or domestic sources. However, crude most likely will come from Canada.

Products from the new refinery will be marketed through Time Oil Co.

Offshore Firm Organized

NEW ORLEANS.—Deepwater Exploration Co. has been organized by a group of individuals and companies to do contract drilling of offshore oil wells. B. V. Bock, Wichita, Kans., will serve as president and chief executive.

Ownership is shared among Bock, J. H. Hester, Anderson-Prichard Oil Corp., Oklahoma City, and Climax Molybdenum Co., New York. Hester will be vice president and general manager of drilling operations. J. Taylor, formerly assistant manager of Gulf Coast drilling for Superior Oil Co., will supervise the Deepwater tender. R. J. Loeffler, formerly with Creole Petroleum Corp., will serve as exploration manager.

The company has acquired an LST which is being converted to a nonpropelled drilling tender. It will be equipped with a National 130E rig capable of drilling to at least 15,000 ft. Drilling operations are expected to start in mid-July off the coast of Louisiana in water depth of 45 ft. The initial well will be spudded under contract to Anderson-Prichard.

Line Offer Snubbed

Financier's Trans-Canada plan not taken seriously

OTTAWA.—A third proposal received by the Government to build the cross-Canada gas pipeline came to light recently in the House of Commons.

Under questioning during debate on the Trans-Canada project, Prime Minister Louis St. Laurent revealed that Finance Minister Harris received the proposal May 10. It came in a letter from Montreal financier Lloyd C. Champion, who claimed he could build the line without government assistance.

The proposal was, however, given the cold shoulder because the finance minister felt it could not be taken seriously.

Champion is the 51-year-old head of Champion Pipe Line Corp., Ltd., which holds a federal charter to build a gas or oil pipeline anywhere in Canada. He said in the letter he would build the line, pay Alberta gas producers with notes instead of cash, and take steps to assure Canadian control.

Since the finance minister decided the proposal was not seriously intended, St. Laurent said it was not placed before the cabinet.

Howard Keck Interrogated

LOS ANGELES.—A representative of a special Senate investigating committee last week interrogated Howard B. Keck, president of Superior Oil Co.

Investigator Paul Kemerick conducted the talks here, but he declined to reveal what information he sought. Kemerick was scheduled to question Keck on his activities in connection with lobbying for the Harris-Fulbright bill which was vetoed by President Eisenhower.

Keck's name entered the lobbying picture when Sen. Francis Case of South Dakota claimed he had been extended a $2,500 "political contribution" during consideration of the bill. The offer was made by a Superior attorney.

The present bipartisan investigation is the second inquiry into lobbying on the natural-gas bill. It is headed by Sen. John J. McClellan of Arkansas.

$77 million for 30-in. . . .

. . Trans-Canada Buys Pipe

CALGARY. — Trans-Canada Pipe Line Co., Ltd., has signed purchase contracts with Canadian and British firms for $77 million worth of 30-in. pipe for its cross-Canada carrier.

The suppliers are:

. . . **Welland Tube, Ltd.,** of Welland, Ont., with a $45 million order.

. . . **South Durham Steel & Iron Co.** of England with a $32 million order.

The two big orders complete contracts for all pipe required for the proposed line. Earlier contracts covered other parts of the line.

The last two orders will provide pipe for the 1,263-mile Winnipeg-Toronto section. Deliveries will start next March and continue through March 1959.

The 200,000-ton order to South Durham Steel was the largest ever made with the company from Canada. It is about double that placed with the firm last October by Westcoast Transmission Co., Ltd., for use on its gas line from Peace River area through British Columbia to the U. S. border.

The 34-in. pipe for the 574-mile section of the line from the Alberta-Saskatchewan border to Winnipeg already is rolling. It is being milled by National Tube Division of U. S. Steel Corp. at McKeesport, Pa., and Orange, Tex.

The U. S. Steel pipe—203,770 tons at 355 tons per mile—will cost $35 million. Contract for its supply was completed several months ago.

Freight cost for moving this pipe to the line will be an additional $8,411,000. Duty and sales tax on the pipe and valves will amount to another $11,600,000.

Pipe for the Toronto-Montreal leg of the line—of 20 and 24-in. size—will cost $9 million.

Import Changes Attacked

Domestic producers claiming Flemming's new formula will hand over 20 per cent of U. S. market to foreign crude

WASHINGTON.—Domestic producers last week accused the Government of paving the way for further increases in imports of Middle East oil.

The producers claimed the "new look" given the cabinet committee formula by Mobilization Director Arthur S. Flemming last month will permit increases in crude imports this year over 1954 of:

. . . **1,300 per cent** from Canada.

. . . **36 per cent** from the Middle and Far East.

. . . **26 per cent** from Venezuela.

In contrast, the increase in domestic production will be only 10 per cent, they claimed.

Source of opposition . . . Top officials of the Texas Independent Producers and Royalty Owners Association and the Independent Petroleum Association of America have laid their views before Flemming.

He has promised to bring them to the attention of the cabinet fuels committee.

The revised formula would give imported crude and products a cool 20 per cent of the domestic oil market. The cabinet committee called for adherence to the 16.6 per cent which foreign oil held in 1954. But last year, imports accounted for 18.3 per cent despite repeated appeals to the importing companies to keep them down.

This new formula was announced by Flemming May 11. In addition to the Canadian and Venezuelan oil which he took out of the picture last October 29, it would exclude all imports to the West Coast and residual fuel oil imports for bunkering or military use *(The Oil and Gas Journal, May 14, page 100).*

This would take out of the picture 77.4 per cent of the total volume of 1956 imports, the producers charge.

At the same time, Flemming asked the importers to cut receipts from the Middle East by 26,000 bbl. daily to bring them into line with the formula.

Imports still heavy . . . But even if this adjustment is made on remaining imports, the lastest program of the importing companies calls for an average of more than 1,400,000 bbl. daily of crude and products for the year.

The excess over the 1954 relationship would be approximately 230,000 bbl. daily for crude and 70,000 bbl. for residual, the producers said.

The increases in the ratio of imports, the largest since 1950, would lead inevitably to inadequate domestic supplies and increasing dependency on foreign oil, Flemming was told.

Industry BRIEFS

BARTLESVILLE, Okla. — Contract for building a natural-gasoline plant on the Roberts ranch of Midland County, West Texas, has been awarded Delta Engineering Co., Houston. Cities Service will be operator with lease holders on the ranch joining in construction. Initial capacity will be 25 million cubic feet daily with ultimate capacity 50 million cubic feet. Residue gas will be sold to Odessa Butadiene Co. for use at a butadiene plant (see below).

ODESSA.—Fluor Corp., Ltd., has the contract to build a butadiene plant near here for Odessa Butadiene Co., owned by El Paso Natural Gas Co., Odessa Natural Gas Co., and United Carbon Co. The plant has a design capacity of 40,000 tons a year.

It will supply a nearby plant to be built by General Tire & Rubber Co. which will consume 32,000 tons of butadiene and 10,000 tons of styrene annually to make 40,000 long tons of synthetic rubber. The mixed butanes raw material will be furnished largely by El Paso Natural. Construction of the butadiene plant will start at mid-summer and is due for completion in a year. Cost will be $20,000,000.

CORPUS CHRISTI.—Three companies affiliated with the Harry Bass interests, Dallas, will move their headquarters from here to Houston, effective June 4. The companies are Goliad Corp., Products Pipe Line Co., and Brasada Oil & Gas Co.

LOS ANGELES. — Richfield Oil Corp. plans to begin trial runs July 1 on its big 17,000-bbl. Sinclair-Baker catalytic reformer at its Watson refinery. Construction on the reformer was begun last year by the Ralph M. Parsons Co. When put into operation, it will be the largest of its type ever built and the first such reformer on the West Coast.

WASHINGTON.—Esso Shipping Co., a Standard Oil Co. (N. J.) subsidiary, will build two 37,800-ton tankers at Newport News, Va. The vessels will replace five T-2 tankers which will be transferred to a foreign flag.

SPARROWS POINT, Md. — The Cities Service Miami, second of three 32,000-ton tankers to be built by Cities Service Oil Co. under the Government's trade-in-and-build program, was launched here last week. The three tankers will replace seven T-2 vessels.

Free-World Flow Growing

March output hits another all-time high of 14,982,900 bbl. daily; Middle East has greatest production step-up

CRUDE production in the free world continued to expand in March, rising to another all-time high of 14,982,900 bbl. daily.

This level of output was 320,300 bbl. daily, or 2.2 per cent, higher than in February.

Free-world areas other than the United States accounted for most of the gain. Their production averaged 7,704,900 bbl. daily, up 250,300 bbl. daily, or 3.4 per cent, over the preceding month. It was the greatest gain in 15 months.

United States output of 7,278,000 bbl. daily also was a record high, the fifth in a row. The gain over February was 70,000 bbl. daily.

The Middle East was the region with the greatest increase. Its total output averaged 3,624,300 bbl. daily, up 6.1 per cent. The gain of 208,600 bbl. daily was the biggest since March 1953.

Big gain in Iran . . . Iranian production was responsible for more than one-half of the increase.

The consortium raised its output by 105,000 bbl. daily, or 24.2 per cent. This gain was greater than at any time since November 1954 when consortium operations began by raising output from 35,000 bbl. to 145,000 bbl. daily.

Production of 1,175,100 bbl. daily in Kuwait was the highest since last May. The sheikhdom's average for the first 3 months was 1,141,000 bbl. daily, up 79,800 bbl. daily, or 7.5 per cent, from the first quarter last year.

The Saudi Arabian average of 1,009,000 bbl. daily was down slightly from both February and March a year ago. But the first quarter average of 1,007,500 bbl. daily was up substantially from the same period last year when production was 54,900 bbl. daily, or 5.8 per cent smaller.

In Iraq, the greatest increase in 3 months was recorded. Iraq Petroleum Co., Ltd., produced 712,000 bbl. daily, a gain of 58,700 bbl. daily, or 9 per cent over February. Compared with the 1955 yearly average, March output was up 31,800 bbl. daily, or 4.7 per cent.

The British Petroleum Co., Ltd., subsidiary which operates Khanaqin, the only field in Iraq not produced by I.P.C., has cut back production sharply. The field's exclusive outlet is the government-owned Alwand refinery. Last year, its operations were curtailed when the new Daura refinery went on stream near Baghdad.

As a result, Khanaqin production was cut back by about 50 per cent in the last half of 1955. The yearly average of 9,200 bbl. daily was down 20 per cent from 1954. In March, output was down to 3,800 bbl. daily from 4,100 bbl. daily in February and 4,800 bbl. daily in January.

Salt troubles Turks . . . In Turkey, where also a single field supplies an interior refinery, opposite conditions currently apply.

Raman field is at present the only supply source for the new 6,950-bbl.-daily Batman refinery. Of the field's 22 wells, 5 are abandoned and recently 6 were shut down. For best field maintenance, only about one-third of the wells should be produced at one time, on a rotating basis.

But all the wells have been worked

TREND OVER THE LAST YEAR

1955—	Western Hemisphere less U.S.	Middle East	Total non-Communist countries
March	3,036.2	3,240.0	6,781.5
April	2,981.6	3,327.6	6,805.9
May	2,932.1	3,287.4	6,718.8
June	3,019.7	3,201.6	6,720.9
July	3,092.7	3,275.8	6,872.1
August	3,140.4	3,243.0	6,978.2
September	3,130.9	3,256.9	6,990.7
October	3,179.6	3,378.2	7,166.0
November	3,255.0	3,386.0	7,248.3
December	3,298.5	3,316.1	7,227.2
1956—			
January	3,363.7	3,392.6	7,368.5
February	3,427.4	3,415.7	7,454.6
March	3,462.8	3,624.3	7,704.9

World-Wide Crude Production

(Daily average in thousands of barrels)

Country—	Mar. 1956	Feb. 1956	Mar. 1955
W. Hemisphere:			
Argentina	83.6	83.6	79.5
Bolivia	8.2	8.8	6.7
Brazil	7.0	7.0	5.5
Canada	454.0	466.9	312.0
Chile	9.2	8.8	6.0
Colombia	119.2	116.0	106.5
Cuba	1.5	1.6	0.7
Ecuador	9.8	9.9	9.4
Mexico	255.0	249.2	250.0
Peru	47.8	47.8	47.9
Trinidad	75.5	75.1	67.2
Venezuela	2,392.0	2,352.7	2,144.8
Total	3,462.8	3,427.4	3,036.2
W. Europe and Africa:			
Algeria	0.8	0.8	1.2
Austria*	64.2	64.2	
France	23.8	23.6	12.3
Fr. Morocco	2.0	2.0	2.3
W. Germany	64.5	63.0	57.8
Italy	9.0	8.4	2.9
Netherlands	19.2	17.0	19.1
Egypt	38.1	36.1	33.3
United Kingdom	1.2	1.2	1.1
Yugoslavia	5.1	4.8	4.9
Turkey	5.5	5.5	2.4
Total	233.4	226.6	137.3
Middle East:			
Bahrain	30.0	30.0	30.0
Iran†	539.0	434.0	300.0
Iraq‡	715.8	657.4	674.2
Israel	0.3	0.3	
Kuwait	1,175.1	1,125.0	1,086.7
Neutral Zone	30.0	30.0	19.5
Qatar	125.1	125.2	112.2
Saudia Arabia	1,009.0	1,013.8	1,017.4
Total	3,624.3	3,415.7	3,240.0
Other Asia:			
British Borneo	113.0	113.0	101.5
Burma	5.2	5.2	4.0
India	7.5	7.5	7.0
Indonesia	240.0	240.0	233.0
Japan	5.9	6.1	6.0
New Guinea	7.1	7.4	10.8
Pakistan	5.7	5.7	5.7
Total	384.4	384.9	368.0
Total, Free World Foreign	7,704.9	7,454.6	6,781.5
United States	7,278.0	7,208.0	6,886.0
Total Free World	14,982.9	14,662.6	13,667.5
Communist Countries in Soviet Orbit:			
Russian Zone of Austria*			68.2
Romania	150.0	150.0	125.0
Russia	1,400.0	1,400.0	1,235.0
Others	50.0	50.0	36.8
Total	1,600.0	1,600.0	1,465.0
World total	16,582.9	16,262.6	15,132.5

*Austria took over its producing fields from Russia in August 1955.

†Includes an estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium.

‡Includes 4,800 bbl. daily and 4,100 bbl. daily in February and March and an estimated 12,000 bbl. daily in March 1955 from Naft Khaneh field, operated by British Petroleum Co., Ltd., rather than I.P.C.

Figures are from reliable reports in the industry or official government sources. Data for Russia and Eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where completely current reports are lacking. Communist countries in the Soviet orbit include satellite countries in Europe and Red China.

hard since the refinery opened last year, and salt water has encroached considerably. The refinery was designed to handle 50 to 70 lb. of salt per 1,000 bbl., but content has run as high as 300 lb. per 1,000 bbl.

Garzan field will serve as another supply source for Batman when a 15-mile pipeline is completed. The field had six producing wells in March.

In the Western Hemisphere, Venezuelan production continued to break all records, averaging 2,392,000 bbl. daily, up 39,300 bbl. daily over February. March output was 10.8 per cent higher than the 1955 yearly average.

Formosa Plant Expands

Chinese Nationalists put big cat cracker on stream, plan to build other modern units at their Kaohsiung refinery

CHINESE PETROLEUM CORP. marked its tenth anniversary last week by putting on stream a new 10,000-bbl. Thermofor catalytic cracker (T.C.C.) at the 30,000-bbl. Nationalist Chinese refinery at Kaohsiung on Taiwan (Formosa).

The new cracking unit, built by Fluor Corp., plus a 3,100-bbl. Catformer which went on stream last year, were the first special process units built at the refinery. They were made possible by long-term loans from American oil companies. They were secured by the Chinese Nationalists with the help of the International Cooperation Administration.

The Chinese government company plans to add alkylation, hydrogen treating, and aromatics extraction units in the near future.

Financed by loan . . . The cracker and reformer were made possible by a $2-million, 10-year loan from Gulf Oil Corp. as part of a long-term agreement between Gulf and Chinese Petroleum. Under the agreement Gulf will furnish the Chinese with Middle East crude for the refinery.

A second and similar 5-year loan for $700,000 was made by California Texas Co. (Caltex). Local-currency financing was provided by Chinese Petroleum through the use of ICA counterpart loan funds.

Under the loan and marketing agreements, both Gulf and Caltex have helped train Chinese nationals in the operation of the refining equipment. They also have provided engineering services to the Chinese government company. Socony Mobil Oil Co., which licenses the T.C.C. unit, and Atlantic Refining Co., the developer of Catforming, are helping train Chinese to operate the two units.

Why plant needed . . . The Chinese government company took over the remnants of a Japanese-built refinery at Kaohsiung after it had been bombed out during the war. The government company rebuilt the plant during 1948 and 1949. Since that time it has improved it almost continuously with the limited materials available. When it became apparent that modern units were needed to meet the Chinese Nationalists' needs for high-octane motor gasoline and jet fuels, the company appealed to ICA for aid in financing the improvements.

ICA officials in Washington said last week that the U. S. agency followed its established policy when it helped the Chinese secure private capital assistance rather than U. S. aid funds.

The new units will enable the Chinese Nationalists to supply all Formosa's high-octane motor gasoline requirements and jet fuel needs. They also will save the government at least $1,500,000 a year in foreign exchange which once went to import petroleum products.

Shell in Pakistan

Exploration rights given for 20,000-sq. mile area

THE fifth oil company—and the second major international company—moved into Pakistan last week when the Royal Dutch-Shell Group signed an agreement with the government giving it 20,000 sq. miles to explore.

The Pakistan Government and Shell Co. of Pakistan, Ltd., formed a new operating company to be called Pakistan Shell Oil Co., Ltd. A 25 per cent interest in the new operating company will be held by Petroleum Development of Pakistan, Ltd., owned entirely by private Pakistani capital. Shell will own the remaining 75 per cent.

Split concession . . . The new company will explore a 10,000-sq. mile tract in Wast Pakistan and another of equal size in East Pakistan.

If commercial oil is discovered, the company will share its profits equally with the Pakistan Government. Shell will begin moving personnel and equipment into the country in July. It plans to start active exploration in the fall.

Standard-Vacuum Oil Co. started its first well in West Pakistan this month. Three other companies, two British and one other American firm, expect to start wildcats in scattered areas of the country in the near future. *(The Oil and Gas Journal, May 28, page 105).*

In addition to Stanvac, the other companies are Pakistan Petroleum, Ltd., a Burmah Oil Co., Ltd., subsidiary; Pakistan Oilfields, Ltd., a subsidiary of Attock Oil Co., Ltd.; and Hunt International Oil Co.

Early arrival . . . The only other company in the country is Attock, which operates three of Pakistan's four producing fields under the terms of concessions granted before new laws required national participation.

Attock and Pakistan Petroleum produce about 5,700 bbl. daily from Khaur, Dhulian, Joya Mair, and Balkassar fields in the northern portion of West Punjab in West Pakistan.

Ship Channel Open

T-2 tankers now can lift cargoes in Lake Maracaibo

THE Lake Maracaibo ship channel connecting the lake with the Gulf of Venezuela was opened last week to ocean-going tankers.

The 35-ft. channel can now handle 18,000-ton, T-2 class tankers. Dredging operations will continue, and the channel soon will accommodate 28,000-ton vessels. Later it will be enlarged to float the largest tankers built.

The 20-mile waterway, built by the Venezuelan Government with the aid of oil companies, will speed crude deliveries and reduce handling. For years it has been necessary to move crude from Maracaibo fields in shallow-draft tankers to the gulf, where the crude was loaded on ocean-going vessels.

Producers benefiting the most from the project will be Creole Petroleum Corp., Cia. Shell de Venezuela, Ltd., and Mene Grande Oil Co., subsidiaries of Standard Oil Co. (N.J.), Royal Dutch-Shell, and Gulf Oil Corp.

The channel has two sections. One, 600 ft. wide and 35 ft. deep, extends from the Maracaibo sand bar southward to the deep water in the lake. The second section runs from the sand bar to deep water in the Venezuelan Gulf. It is 6 miles long, 1,000 ft. wide, and 37 ft. deep.

A 2¼-mile breakwater was built in the gulf 3,000 ft. east of the channel to prevent refilling with silt. It is 100 ft. wide at the base, 24 ft. at the top, and is 10 ft. above high tide.

Jones Makes New Cuban Strike

A WILDCAT 4 miles east of the small production on Cuba's north shore near Havana has discovered heavy crude.

The well, 1 Juanita, had a flow of 48 bbl. daily of 12°-gravity crude on a 3-day test through a 2⅞-in. tube. It was drilled by Ted Jones, California independent, who is operating in Cuba through Empresa Petroleras Jones de Cuba.

The 1 Juanita is located on Jones' 44,000-acre Quadreny I concession which runs along the north shore east of Havana. The flow came after two zones were perforated, 1,862-80 and 2,072-82 ft.

The well has been drilled to 4,400 ft. It will be deepened to 5,600 ft. and four more zones will be perforated. The section is limestone except for two serpentine fingers.

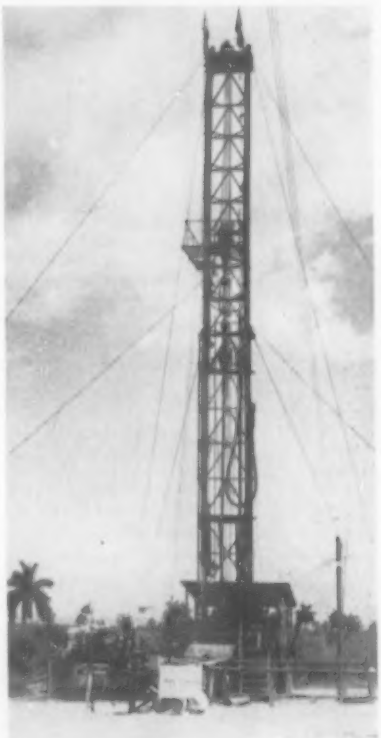
Kewanee takes over operation . . . Cuban Kewanee Oil Co. has taken over Jones' operations at the Thomas Bess concession to the west, with Jones retaining 17½ per cent of production.

Four wells have been drilled and development will continue on a 20-acre spacing pattern.

The 4 Jones offset, bottomed at 5,700 ft., tested 180 bbl. daily before perforation with 42 ft. of open hole. It is being completed as a producer. No. 1 produces 90 to 110 bbl. daily flowing and on pump, while No. 2 has an output of 125 bbl. daily.

New company formed . . . Jones, active in Cuba for 2½ years, is reorganizing his operations.

He is forming a new company, United Cuban Oil Co. Assets will include $700,000 in equipment in Cuba, $400,000 in cash and notes receivable, 150,000 acres in leases in Cuba, and 36,000 acres in Torrance County, New Mexico. He plans to ask the Securities Exchange Commission for permission to sell stock.



United Cuban will buy reserves and production in the United States to finance wildcatting with one rig in Cuba and one in the U. S.

Signal Gets Guatemala License

GUATEMALA'S first petroleum exploration concession has gone to Signal Exploration Co., subsidiary of Signal Oil & Gas Co., Los Angeles.

Most of the 673,000 acres covered by the license are in the southeast corner of the Department of Peten, considered to have the best prospects in the Central American country. Some acreage is in the Departments of Izabel and Alta Verapaz. Signal also has three other applications pending involving 325,000 acres in the Department of Izabel.

A geological party is being formed and actual exploration is slated to begin within a few weeks. The entire country is rank wildcat territory, untested by the drill.

Signal's concession was approved by Minister of Economics Salvador Saravia under Guatemala's new oil code. The code was prepared under the direction of President Carlos Castillo Armas, opening the country to foreign oil firms for the first time since 1949. Earlier a few international companies carried out preliminary exploration but quit the country when they were unable to obtain reasonable concession terms.

The concession granted Signal was included in one of the few applications which did not conflict with acreage sought by another company.

Twenty-eight other companies and individuals have applied for 90 tracts in the country *(The Oil and Gas Journal, December 5, 1955, page 95)*. The applicants have been trying for weeks to iron out overlapping applications.

International BRIEFS

D'Arcy Shell Petroleum Development Co. of Tanganyika has started a deep test on Zanzibar. The company, operator for a joint British Petroleum Co., Ltd., and Royal Dutch-Shell exploration program, used the same rig for an earlier test at Mafia Island *(The Oil and Gas Journal, February 20, page 103)*.

United British Oilfields of Trinidad, Ltd., has changed its name to Shell Trinidad, Ltd. The company produces about 18,000 bbl. daily of crude and operates a 30,000-bbl. refinery at Point Fortin.

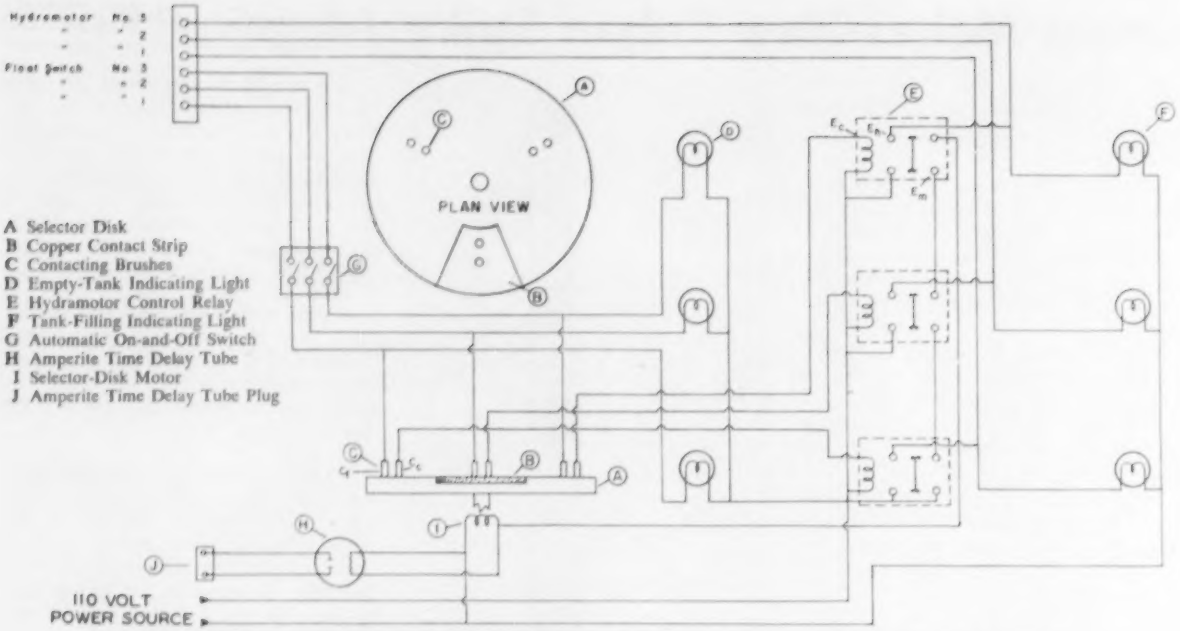
Work has begun on the 35-mile pipeline from Ragusa field, in Sicily, to the 44,000-bbl. RASIOM refinery at Augusta. The line will replace railroad transportation from the field. It is expected to be ready by the end of September *(The Oil and Gas Journal, December 12, 1955, page 140)*.

Pemex completed 131 wells in the first 4 months of 1956, compared with 113 in the same period last year. The state company hopes to drill at least 450 wells this year, aided by 20 new rigs to be delivered by November *(The Oil and Gas Journal, March 26, page 89)*.

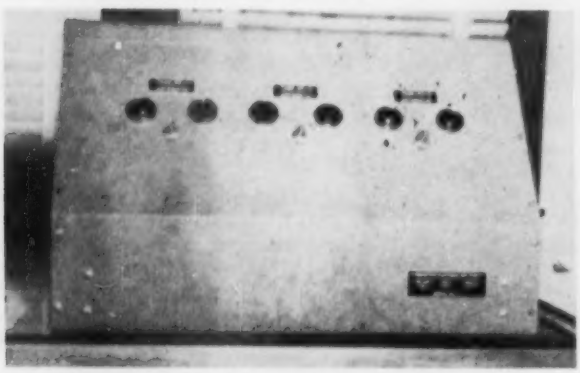
A $3,500,000 dredging project to deepen Corio Bay to accommodate large tankers is now under way in Geelong, Australia. The job is expected to be completed in 1958. It will enable tankers up to 32,000 tons to serve the 36,000-bbl. refinery operated by Shell Co. of Australia, Ltd.

Two coal-mining companies in Southern Rhodesia will spend $100,000 to investigate the possibility of setting up a coal-to-oil plant at Lubimbi field, which has more than 80,000,000 tons of recoverable reserves. Sponsors called the study strictly preliminary. Meanwhile, technical problems continue to delay full production at the $112,000,000 SASOL coal-to-oil plant in neighboring Union of South Africa.

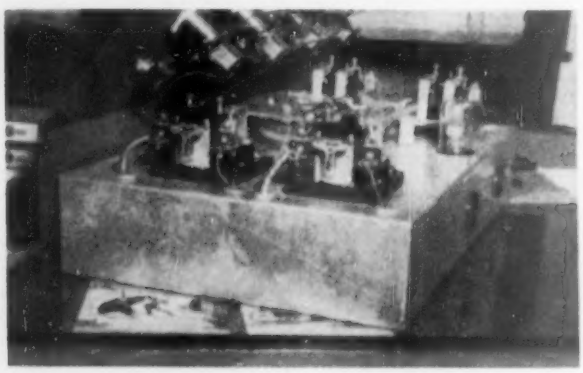
A 10-man team of the North Atlantic Treaty Organization pipeline-planning group has completed a tour of pipeline operations in the U. S. Great Lakes Pipe Line Co. was host. The tour included visits to diesel and electric stations, a briefing on supervisory controls, corrosion control, warehousing, and terminal operations. The team was interested in learning U. S. methods, as NATO's big job now is to train operators for the 4,500-mile military pipeline system in Europe.



SCHEMATIC DIAGRAM of electric tank switcher used by Gulf. Lights show condition of each tank. Fig. 1.



TANK SWITCHER with condition indicating lights. Fig. 2.



SWITCHER is compact and simple, uses conventional parts. Fig. 3.

PRODUCING

1. CASE HISTORY—Gulf Oil's experience with

Automatic Control of Production

by C. R. Bayless* and F. J. Mikeska†

This series of articles details experiences over the past few years with various types of automatic production controls in several fields. Part 1 shows some direct and intangible savings to Gulf as a result of automatic controls in East Texas. Intangibles show up as better use of labor; cleaner, more efficient production, and smoother system operation. Direct savings show that automatic equipment will pay out in about 2.4 years in East Texas field.

INCREASED use of automatic controls in the past few years has allowed the petroleum industry to expand with a minimum increase in operating cost and, in many cases, a reduction in cost. This is especially true in the producing division of the industry.

Controls have not yet reached the stage where all elements of any one

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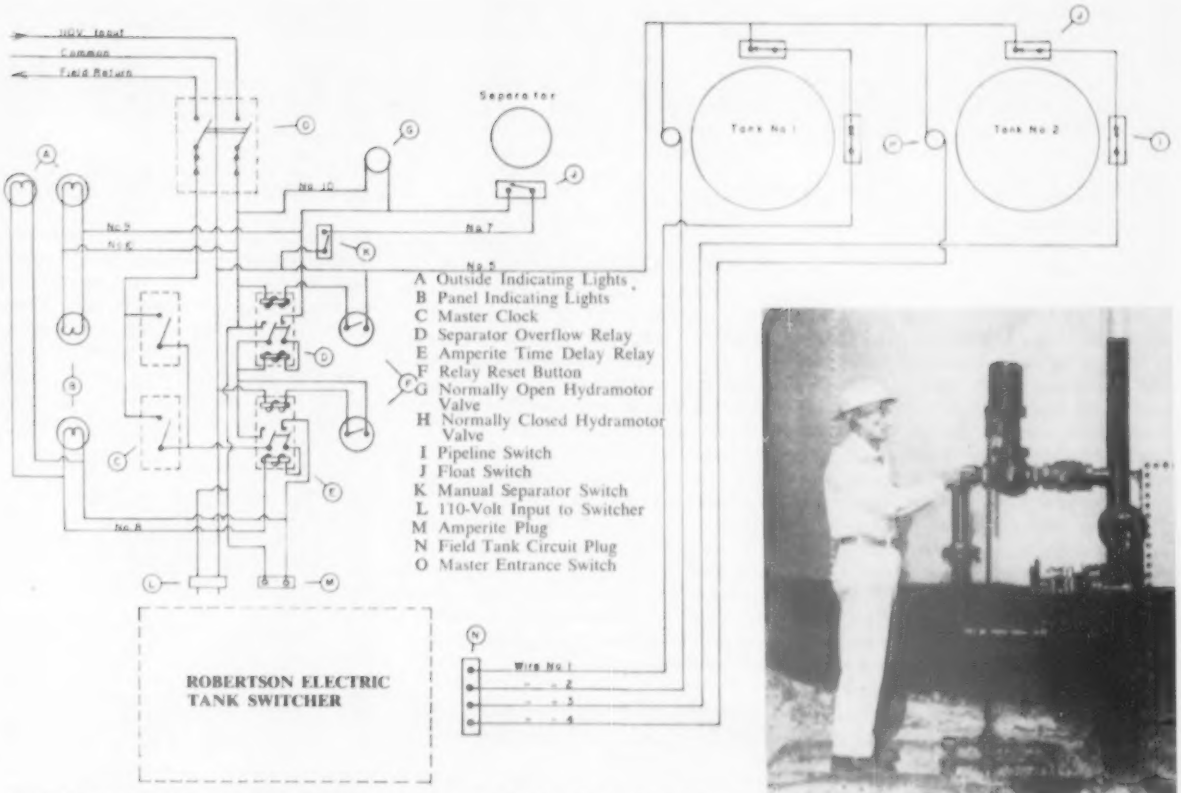


WIRING DIAGRAM of a typical battery, using the tank switcher. Lease shuts down when all tanks are full. Fig. 4.

TANK FILL-UP valve. Fig. 5.

producing system can be made to operate automatically. But many of these elements are being successfully operated automatically at different locations. In fact, fully automatic operation in some locations awaits only the acceptance by all parties concerned of methods now being tested.

In Gulf Oil Corp.'s Houston division the first automatic lease control installation consisted of a combination pneumatic and electrically operated system of tank-switching and well controls, which was primarily a test installation of various make components from which the presently used controls were developed. This was necessary because proved equipment and methods did not exist at that time.

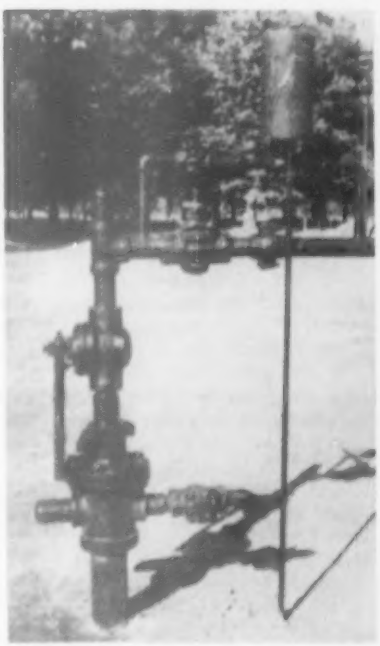
These early tests showed that for the type of automatic producing operations in East Texas field electric controls were more readily adaptable due to availability of power and production operating features. Consequently, all subsequent installations in this area have been completely electrically operated.

Tank switcher . . . The system now used is built around an electric tank switcher, developed by local Gulf employes, which directs the flow from one tank to another as each is filled. When all tanks are filled, it deenergizes the individual well controls, thereby closing the wells.

The individual well controls consist of electric control valves on the flowing wells, electric control switches on the pumping wells, and time-cycle controllers to operate the wells according to proration and gasoline-plant schedules. The well controls are also coordinated with the safety features at the tank batteries.

Fig. 1 shows a circuit diagram of the electric switcher. Fig. 4 shows a wiring diagram of a typical tank battery. Figs. 2, 3, 5, and 6 show the various components in operation.

The switchers and control panels for these installations are located in pumpers' houses at the tank batteries. Indicating lights show the condition of each tank at the battery. Other features of the system include high-level switches in the separators and switches on the pipeline connection of each tank to prevent flowing into the tank while a pipeline run is being made.



HYDRAMOTOR valve used on well. Fig. 6.

Functions . . . A brief discussion of the above listed essential equipment is as follows:

Use of the well-head control valve permits "stop-cocking" the well according to a predetermined flow schedule. This is done by setting the desired flow interval on the electrically driven time switch.

Manual selective or automatic se-

quential switching of flow from the separator to the stock tanks is afforded by the tank-selecting mechanism.

The tank-overflow-control equipment prevents overflow of stock tanks by automatically closing in the lease when all lease storage becomes filled. The separator-overflow safety switch prevents overflow of oil into the gas-gathering system. It shuts in the lease when separator fluid level rises above a preset point.

Pipeline safety switches prevent switching into a stock tank being run by the pipeline. The heater-treater safety switch functions about the same as the separator safety switch; however, two fluid levels rather than one are controlled—namely, the oil and water level. This prevents overflow of salt water to stock tanks, oil into the salt-water gathering system, or fluid into the gas-gathering system.

The master time switch shuts down the entire lease on down days. These down days may be easily changed to conform with gasoline-plant requirements by changing the master time switch rather than time switches at individual wells.

Switcher operation . . . Fig. 1 is a schematic of the tank-switching device. To understand its operation, assume the lease is operating, switch G is closed, tank 2 is filling, and tanks 1 and 3 are empty.

Relay 2 is energized since its coil circuit is complete through contacts on the selector disk, after which the left-hand contacts of relay 2 are made. Relays 1 and 3 are not energized since associated contacts on the selector disk are open.

Hydramotor 2 (in the fill line of tank 2) and filling light 2 are receiving power through contacts on relay 2. Note that right-hand contacts on relays 1 and 3 are made during this time since these are double-pole double-throw units. Since all float switches are still closed, all the tank empty lights in the center of panel are burning.

When tank 2 has filled, the high-level float switch opens, breaking the circuit to coil of relay 2 and hydramotor 2 shuts, filling light 2 and tank empty light 2 go out.

The right-hand contacts of relay 2 closed as it dropped out, completing a circuit to the timing motor coil and starts it turning. Contacts for tank 3 are made on the selector disk as soon as the latter has turned 120°. This starts the process all over again; i.e., relay 3 closes, hydramotor 3 opens, etc.

Lease protective system . . . Fig. 4 is a wiring diagram of a typical battery. Operation is as follows:

Assume the master entrance switch O is closed and tank 2 is filling.

The switcher will be in operation as previously described. Production from the lease will enter the separator through hydramotor valve G and be directed to tank 2.

When tank 2 has filled, float switch J will open and the automatic switcher will select the next tank ready to receive production.

Tank 1 would not be ready to receive production if full or if on pipeline run. In this event, the switcher selector disk would make one complete revolution and then the Amperite time delay tube contacts would close, causing relay E to receive power and close its contacts, shutting the field down. Appropriate lights A and B will remain lighted to indicate cause of shutdown.

Should separator float switch J close due to high level, hydramotor G would become energized and close. Separator overflow relay D would be energized and light A and B would indicate the source of shutdown.

The lease would remain down until the cause of shutdown was corrected and the shutdown relays reset for normal automatic operation.

Economics of program . . . Economic justification of automatic controls has been based solely on a reduction in operating expense. As may be seen in Table 1, by 1953 a saving in annual operating cost of $58,100 was realized in East Texas due to installation of controls on 18 leases. Total cost of equipping these leases was $186,016, giving a payout of 3.2 years.

As with any mechanical or electrical equipment, troubles due to failure of equipment were anticipated; however, the expenses involved in remedying these failures are so minor with respect to the savings that they are negligible. Cost records of repairs and maintenance on automatic control equipment show an expense of about $67 may be expected initially; these expenses will gradually decline as operational difficulties are corrected.

If these maintenance and repair costs were included in Table 1 the payout would be extended by only .07 years. Therefore, from an economic-payout viewpoint, the present installations are more than justified.

By the end of 1953, the number of installations in East Texas had been extended to a total of 390 wells and 22 tank batteries on 20 leases, with a total investment of $209,516. Payout at this time was figured at approximately 2.4 years per installation.

In East Texas field, as of December 31, 1955, Gulf had 537 wells and 32 batteries on 27 leases equipped with automatic controls.

Intangible savings . . . Below are several secondary advantages coincident with automatically controlled production. These cannot be economically evaluated, but are of sufficient importance to production practices in East Texas to merit discussion. Each is the result of using automatic controls and is achieved without using extra labor which would be required for the same results if the leases were manually operated.

TABLE 1—STATUS OF AUTOMATIC EQUIPMENT INSTALLED IN EAST TEXAS

Number of leases equipped (Mid '53)	18
Number of wells	346
Number of tank batteries	20
Savings in operations, annual (approximately)	$ 58,100
Total cost for automatic controls	$186,016
Payout period, years	3.20

. . . Better use of pumper labor. By reducing physical labor required for these men, it is possible to gainfully use their services elsewhere to the company's and their own advantage. Also, it reduses the human error factor to a minimum.

. . . Smoother gasoline plant operation. Gulf operates two gasoline plants in East Texas, with the majority of its produced gas being delivered to them. To operate at efficient and optimum rates, these plants must be furnished gas at a steady rate throughout any 24-hour period.

By equipping certain leases with automatic controls, production from large as well as small leases can be distributed uniformly over a 24-hour period with a minimum of operating labor.

. . . More efficient production. Perhaps the most important secondary advantage to using automatic production control is the assuring of proper reservoir depletion. East Texas field is being produced from a highly porous and permeable sand with a very active water drive; thus, premature flooding of the oil sand results where a pressure differential sufficient to cause "coning" exists due to excessive withdrawals or withdrawal rates. Geographical location of the wells, existing weather conditions, and human errors are contributing factors of such coning on manually operated leases.

. . . Cleaner, safer production. Coincident with installations of automatic equipment are increased safety and cleaner operating conditions. This is done by means of the separator overflow safety switch and the pipeline safety switch. Each of these switches insures no loss in production to gasoline plants or pipeline companies.

Safer conditions are insured by having a means to automatically close in all wells on the entire lease in event of dump-valve failure on the separator or plugging of the filling line between separator and stock tanks.

Operate your cat cracker for . . .

Maximum Yield of Catalytic Naphtha

Over-all results show slight gain in octane number for gasoline pool, and saving is possible

by R. C. Davidson, R. S. Shute, and R. B. Secor

IN spite of the growth of catalytic reforming and the increased use of alkylate in motor gasoline, the catalytic cracking unit still provides the major portion of the high-octane component for most gasoline pools. The performance of the cat cracker, therefore, has a very significant effect on the final octane number produced in a refinery.

Although the yield-octane relationship is the standard procedure for representing catalytic reformer data, the press for higher octane has tended to obscure the fact that this relationship is also of major significance in catalytic cracking. **Sacrifice of naphtha yield from the catalytic cracking unit for a few octane numbers is not only expensive but may not give as high a final octane level in the pool.**

This point has been illustrated by a comparison of data from a pilot-plant study in which a blend of fresh and recycle gas oils as charged to a commercial cracking unit were converted over equilibrium catalysts. The final results indicate not only a slight gain in octane number but a significant economic advantage for the catalyst giving a greater yield of catalytic naphtha.

The comparison differs from information previously published in that:

1. The study was preceded by an evaluation of the optimum method for operating with each catalyst.
2. Catalyst holding time in the reactor approximated commercial operation.
3. Feed stock was a blend of fresh feed and catalytic recycle from a refining unit.
4. Adequate quantities of steam were used and commercial conditions were simulated insofar as possible.
5. Advantage was taken of price differential between the catalysts, i.e., the less-expensive catalyst was taken from a commercial unit where a higher makeup rate had been employed to achieve an optimum quality.

This last point is of significance and

REFINING

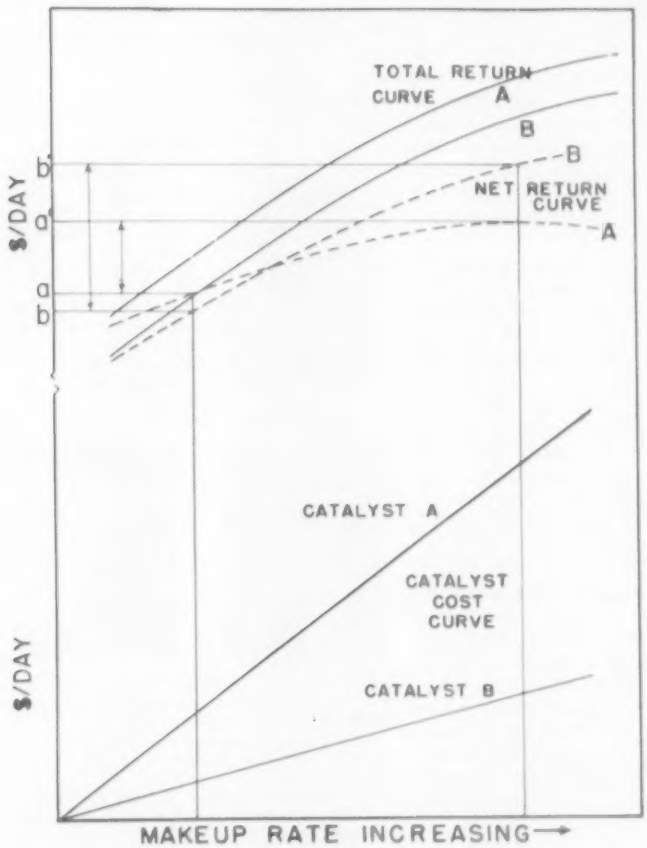


Fig. 1—Economic value of makeup.

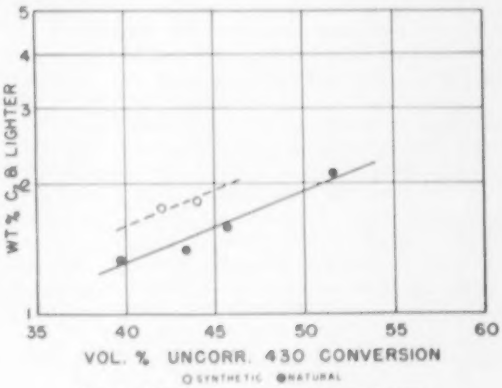


Fig. 2—Dry gas vs. conversion total feed.

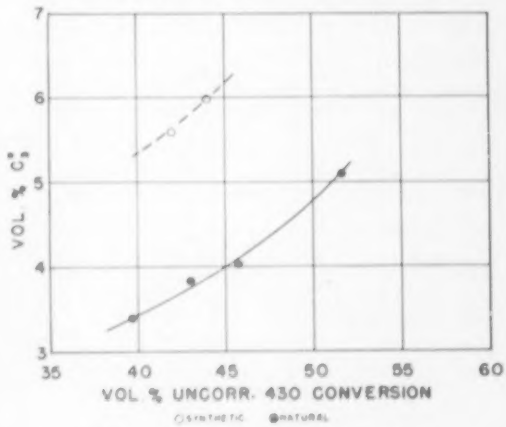


Fig. 3—Propylene vs. conversion total feed.

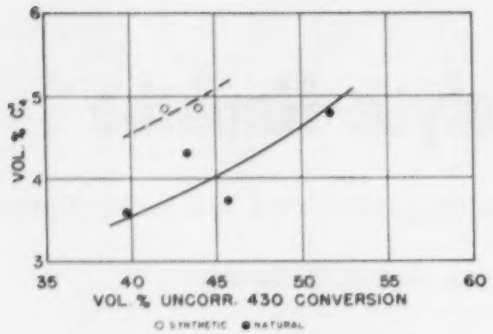


Fig. 4—Butylene vs. conversion total feed.

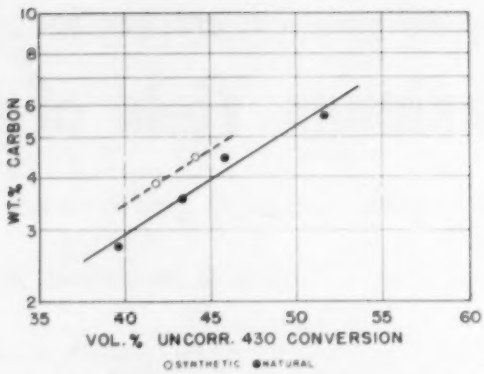


Fig. 6—Carbon-conversion relationship total feed.

is best illustrated by the diagram in Fig. 1. Assuming for the moment that the operator can control makeup rate at almost any desired level, the purpose of increasing makeup is to increase the value of products from catalytic cracking, regardless of type of catalyst. This is especially applicable where the refiner is attempting to charge the most barrels through the feed-preparation system and subsequently through the catalytic cracker.

Some such curve as the total return curve in Fig. 1 may be developed. Deducting the cost of the catalyst then gives the net return curve, and a maximum point on the net return curve can generally be computed as at **a'**. However, for one reason or another, an operator may have settled on a point such as **a**. The difference between **a** and **a'** may be large or very small; in the diagram it will be noted that the makeup rate must be almost quadrupled to reach point **a'**.

Inasmuch as the gain from a high makeup-rate program may rapidly reach the point of diminishing return, a high makeup rate may have been unrewarding during some previous test period. It is quite apparent from Fig. 1 that the return is dependent upon the type of catalyst.

Many catalyst comparisons have been made with a view toward holding the same makeup rate and the economic return calculated for points **a** and **b**. It will be noted from the relationships in Fig. 1 that the potential income between **b** and **b'** is being overlooked, and the gain is significant enough to make an increased makeup rate program appear to be worth while. The less expensive catalyst compared in the following study more nearly corresponds to the elusive point **b'** and the results obtained were quite striking.

Pilot-Plant Study

Characteristics of the catalysts and feed stocks used in this pilot-plant study are listed in Table 1. The activities were obtained by the Jersey D+L test.[1] The catalysts were evaluated in a continuous cracking unit of the type described by Grote et al.,[2] and operating data are shown in Table 2.

Yield figures are shown in Table 3, and the significant points for comparison have been plotted in Figs. 2 through 6. Although more test periods were made with natural catalyst on the recycle-fresh feed mix, data have also been included in the tables for fresh feed only and for a sample of badly deactivated natural catalyst.

The relative laboratory ratings between types of catalysts have little if any significance when compared with relative performance in short process period continuous cracking at plant conditions. Particularly marked is the difference in unit activity, (i.e., ability of the catalyst to convert gas oil in the continuous unit) for the same laboratory activity.

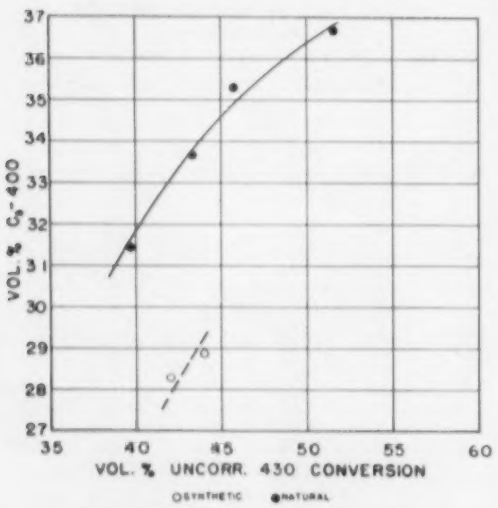


Fig. 5—Gasoline vs. conversion total feed.

Coke yields . . . The lower coke figure for the natural catalyst is the crux of the catalyst comparison and the operating reasons for this lower figure are moderate and attainable though not recognized in the many tabulations which have appeared in the literature showing higher coke for natural catalyst.

The continuous cracking unit was operated in this laboratory with two purposes: (1) approach carbon on regenerated catalyst, holding times, stripper temperatures, and steam use which are characteristic of plant operation, and (2) determine the optimum methods for operating with natural catalyst. In addition the equilibrium natural catalyst was taken from a unit where catalyst replacement was high.

These factors all combine to give the

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observed results and several commercial comparisons on a similar basis confirm these observations. However, most units are designed for competitive bidding, particularly in recent years, and in many cases the unit was not planned with natural catalyst in mind.

Hence, only a few operators have been able to realize the full yield advantage of the natural catalyst, but with an octane squeeze, it is important to determine whether or not more octanes can be obtained from the cat cracker and just what the cost might be as compared to other processes that generally decrease the yield of gasoline per barrel of crude.

Carbon burning . . . Because most units operate at carbon-burning limitations, the conversion which can be obtained is a function of air utilization. In the regenerator, natural catalyst has demonstrated a rapid burning rate and low hydrogen in coke but it converts more CO to CO_2. The first two characteristics almost, but not quite, offset the extra CO_2 production. However, a flue-gas analysis can be estimated when making reasonable assumptions on the relative CO_2/CO ratios, quantities of O_2 in flue gas, and hydrogen content in coke and the amount of carbon can then be calculated.

Typical figures based on commercial experience are given in Table 4.

TABLE 4—TYPICAL FLUE-GAS ANALYSES (NO AFTERBURNING)

Catalyst—	Synthetic	Natural
CO_2/CO in flue gas	1.25	2.0
O_2, excess in flue gas, per cent	0.8	0.5
Carbon on regen. cat	0.45	0.35
Hydrogen* in coke, wt. per cent	9.5	8.3

*By O_2 disappearance.

The lower hydrogen in coke for natural catalyst is not due to better stripping but to the nature of the catalyst as well as to greater ease of burnoff and less oxygen lost through adsorption by carbon on the regenerated catalyst.

With 6,000 moles of air available, as an example (173,880 lb. dry air per hour) the carbon burnoff was computed to be 13,310 lb. per hour with the hydrogen at 1,390 lb. per hour for synthetic; for natural the carbon burnoff was 13,330 lb. per hour with the hydrogen at 1,205 lb. per hour. These numbers were obtained from the analyses as listed in Table 4, the assumption that 0.7 per cent strippable carbon should be added to the pilot-plant carbon yields to approach plant figures, and the relationship:

$$\text{Per cent CO} = \frac{100 - 4.784\ (\%\ O_2 \text{ in flue gas})}{4.784\ (CO_2 - CO) - 2.892 - \dfrac{11.28\ (\%\ H_2 \text{ in coke})}{\%\ \text{carbon in coke}}\ (C_2/CO - 1)}$$

$$\text{Per cent } CO_2 = (CO_2/CO)\ (\%\ CO)$$

The heat released for the combustion of these quantities is 206.5 M.M. B.t.u. per hour for synthetic and 208.9 M.M. B.t.u. per hour for natural; hence, a slight adjustment in operating conditions would be needed for a heat-balance unit in changing from one catalyst to the other.

Assuming a typical operation corresponding to the 6,000 moles of air to be 12,500 bbl. per stream day of fresh feed and 7,150 bbl. per stream day of recycle for a total of 250,000 lb. per hour, the conversions corresponding to the above calculated carbon yields by use of Fig. 6 are 44.7 per cent for synthetic and 47.7 per cent for natural, the other yields corresponding to these conversions are given in Table 5.

Octane Blends

In order to estimate the octane number of the final gasoline pool, the available poly gasoline, 4,000 bbl. per stream day of straightrun gasoline and butane (for pressure) were blended in accordance with common procedures. The final number of barrels and clear octanes are shown in Table 6. In addition, cases have been shown for pressuring to 12 lb. R.v.p.

Leaded octanes were not available but the clear numbers shown here should be sufficient to yield competitive products when 2-2.5 cc. of TEL are added.

Table 6 shows a much simplified economics comparison for the yields given in Table 4 indicating the advantage for the natural catalyst to be approximately 20 cents per barrel of fresh feed at no loss in pool octane. This economic advantage is of course primarily due to the increase of over 28 per cent in the 10-lb. R.v.p. catalytic naphtha.

There are obviously an infinite number of variations on blending product unit values, and methods of obtaining yield differences which could be shown. These data do not apply to any single refinery; each plant is a specific case, and must be studied and calculated separately, particularly with respect to the blending octane numbers.

The arbitrarily selected values given here are merely to indicate general relationships and the economic gain without loss in octane which accompanies the use of an inexpensive catalyst giving a higher naphtha yield.

Modifications . . . In connection with these tests, several items were, of necessity, neglected. The recycle feed was taken from a commercial operation at one conversion level with one catalyst. As type of catalyst varied and the conversion level changed, both the quality and the quantity of recycle would be altered. However, it was not possible to run the pilot-plant unit to produce an "equilibrium" cycle stock.

Consequently an accurate yield of heating oil and heavy fuel could not be estimated. This may be a disadvantage for natural inasmuch as this catalyst normally gives more 430°-

TABLE 1—CATALYST AND FEED-STOCK CHARACTERISTICS

Catalyst—	Synthetic A	Synthetic B	Filtrol 58A poisoned	Filtrol 58B high makeup
Per cent Al_2O_3	22	13	16	16
D+L	22.2	25.9	16.1	27.0
Weight per cent gas	3.51	3.77	4.02	5.15
Gas density	0.759	0.812	0.431	0.679
Weight per cent carbon	1.15	1.04	2.12	1.77
Volume per cent conversion	25.6	29.5	21.9	30.7
Carbon-producing factor	1.48	1.02	3.42	1.59
Gas-producing factor	0.97	0.85	2.25	1.33
Weight hourly space velocity	0.800	0.837	0.636	0.780
Rel. act.	32	44	17	44

Feed—	Fresh	Recycle	Blend
°A.P.I.	31.7	24.9	29.9
Distillation 15/5:			
Per cent at 430° F. vapor temperature		1.2	3.1
20 per cent point	525	590	553
Average boiling point	658	652	661
80 per cent point	792	714	770
80-20	267	124	217
Correlation index	33	50	37
Conradson carbon	0.05		0.05
Aniline point	164	160	
Diesel index	52.0	39.8	

650° F. vapor temperature fraction. The greatest deficiency of the natural catalyst in the octane picture is the low yield of poly gasoline. By changing the reactor temperature, the yield of unsaturates could be increased, which in turn would increase the yield of poly at the expense of gasoline.

However, a complete study of a particular unit, feed stocks, heat balance, etc., would be required to determine the optimum point of poly versus catalytic gasoline for optimum octane. This subject is beyond the scope of this discussion but it is another point for investigation as the octane race becomes more severe.

An added consideration in the press for octanes lies in the reformate volume. A supplementary calculation to those in Table 6 was made in which all straightrun was charged to the catalytic reformer. At 85 per cent yield and 85 octane in the catalytic reformer, the relative final clear octane numbers were 92.4 for synthetic and 92.2 for natural with an over-all yield advantage of 1,169 bbl. per day for the natural.

By increasing severity, to increase the clear octane from the catalytic reformate in the natural case, the final octane number can be raised to 94.0 and the yield advantage is still calculated to be 984 bbl. per day. It is very obvious, therefore, that volume of naphtha yield as well as the octane number from the cat cracker must be taken into consideration when estimating future octane requirements, and the optimum octane levels required from other gasoline-producing units.

TABLE 2—OPERATING

Run No.	56-1	56-2	56-6
Catalyst	Syn. A (22% Al_2O_3)		
Feed stock	Fresh	Fresh	Fresh
Conversion uncorr. 430 fresh feed	45.38	40.57	57.10
Weight hourly space velocity	2.22	2.93	1.22
Catalyst to oil	10.67	7.63	18.51
Reactor holding time, minutes	2.53	2.68	2.70
Superficial velocity, ft. per second	0.131	0.163	0.080
Reactor temperature, °F.	926	928	923
Dispersion steam, weight per cent total feed	0	0	0
Oil partial pressure, atm.	1.00	1.00	1.00
Feed preheat, °F.	701	700	702
Regenerator temperature, °F.	1,061	1,060	1,058
Stripping steam, lb./M. lb. cat.	18.27	17.67	19.25
Stripper temperature, °F.	901	901	900
Carbon on regen. cat.	0.455	0.273	0.349
CO_2/CO	2.20	2.53	2.55
Recovery, weight per cent	98.24	97.39	97.76
Water recovery, weight per cent	91.3	82.6	93.2
20+ conversion, total feed	52.12	45.99	63.89
Unit activity	0.113	0.118	0.112

*63.6 per cent fresh feed, 36.4 per cent recycle. †To simulate heat of hydration in stripper.

TABLE 3—YIELD DATA FROM CONTINUOUS CATALYTIC CRACKING PILOT UNIT

Run No.	56-1	56-2	56-6	56-28	56-30	56-3	56-35	56-34	56-44	56-45	56-49
Conversion 430+, uncorrected	45.38	40.57	57.10	44.02	41.97	44.05	55.96	51.64	45.73	43.32	39.67
Conversion 430+, corrected	44.04	39.11	56.05	42.23	40.11	42.67	54.87	50.09	43.99	41.51	37.74
C_2 and lighter, weight per cent	1.50	1.31	3.16	1.82	1.77	1.39	1.69	2.01	1.59	1.41	1.34
Cu. ft. of gas per bbl.	138.6	103.5	210.7	124.7	122.3	164.6	147.4	180.6	130.2	108.0	109.3
H_2, weight per cent	0.08	0.07	0.10	0.05	0.06	0.19	0.12	0.13	0.09	0.06	0.07
$C_3^=$, volume per cent	3.07	2.63	5.75	5.98	5.60	2.06	5.46	5.09	4.03	3.84	3.39
C_3, volume per cent	1.81	1.33	1.90	1.36	1.42	1.18	1.09	1.47	1.03	0.98	0.82
C_3 and lighter, weight per cent	5.46	4.60	8.99	6.17	5.92	4.19	5.65	5.89	4.60	4.27	3.83
i-C_4, volume per cent	3.07	2.63	5.75	4.42	3.55	2.06	3.61	3.89	2.75	2.53	2.40
n-C_4, volume per cent	1.81	1.33	1.90	1.48	1.57	1.18	2.16	1.42	1.20	1.12	1.16
$C_4^=$, volume per cent	5.03	4.59	6.72	4.85	4.85	4.11	5.76	4.81	3.74	4.31	3.59
C_5-430° F. vapor temp., volume per cent	34.15	31.85	37.1	28.87	28.00	36.08	43.47	36.69	35.30	33.68	31.45
D+L at 158° F.	33.5	30.0	35.5	37.0	35.0	24.0	27.5	29.0	26.5	27.5	28.5
D+L at 212° F.	50.0	47.5	51.0	54.5	50.0	44.0	47.0	48.0	45.0	47.0	46.8
Per cent aromatics	27.4	26.7	26.4		33.3	22.8	27.9	26.4	23.1	20.3	21.4
Per cent olefins	36.0	42.5	31.0		35.7	44.9	32.0	30.3	33.1	42.3	43.4
Per cent saturates	36.6	30.8	42.6		31.0	32.3	40.1	43.3	43.9	37.4	35.2
C_5-302° at 90 per cent point	26.96	24.60	29.9	24.54	22.54	27.25	33.07	29.35	27.85	27.13	25.16
430°-650° F. vapor temp., vol. per cent	36.74	39.60	36.83	34.9	37.67	43.04	41.20	37.22	39.35	38.24	41.22
650° F. vapor temperature plus	17.88	19.83	6.07	21.0	20.4	12.91	2.8	11.1	14.9	18.44	19.11
Carbon, weight per cent	2.61	1.88	4.74	4.50	3.82	2.79	4.27	5.63	4.99	3.55	2.72
H_2 in coke	11.5	8.90	9.74	6.73	7.33	8.10	8.85	7.05	6.37	6.73	6.36

Note: Gasoline composition obtained on gasoline as cut rather than exact C_5-430° fraction; differences are small, however. Carbon is determined by both Orsat and carbon on spent and regenerated catalyst; above values are for Orsat and generally runs higher than by carbon analysis.

TABLE 5—YIELDS AT COKE-BURNING LIMITATION RECYCLE OPERATION

Catalyst—	Synthetic	Natural
Conversion, volume per cent total feed	44.7	47.7
Gas (C_2^-) F.O.E., bbl.	440	379
$C_3^=$, bbl.	1,189	855
$C_4^=$, bbl.	1,002	845
Poly estimated barrels	1,610	1,264
C_5-400° F. gasoline	5,459	6,846
R.v.p. (estimated from D+L data)	8.4	7.2
F-1 clr. O.N.	91.4	89.6
$C_3^=$ unrecovered $C_3^=$	592	464
Excess C_4	984	528
(430°-650° F. vapor temperature), bbl. (A portion to recycle)	(7,035)	(7,483)
Plus 650° F. vapor temperature, bbl. (A portion to recycle)	(3,831)	(2,789)
Coke, lb. per hour	13,700	13,535

The observed octane number from the synthetic operation is in agreement with commercial experience; the octane differential between the two catalysts is also normal for plant practice although it is less than the differential frequently quoted from pilot-plant data where considerably longer holding time or lower reactor temperatures were used.

Summary

In this study a plant feed stock and recycle gas oil were blended together and charged to a continuous catalytic cracking unit for the purpose of comparing natural and synthetic catalysts. The natural catalyst was run under conditions which were felt to be close to actual plant conditions.

The results show a lower octane catalytic naphtha from the natural but over-all considerations show an actual octane benefit and additional income

DATA CONTINUOUS CATALYTIC CRACKING UNIT

56-28	56-30	56-3	56-35	56-34	56-44	56-45	56-49
—Syn. B (13% Al_2O_3)—		"58" A	Filtrol "58" B				
Plant blend	(*)	Fresh	Fresh	Plant blend*			
67.89	64.35	44.05	55.96	79.42	70.34	66.81	61.02
1.58	2.01	1.96	1.96	1.85	2.40	3.14	3.79
11.33	9.87	10.06	10.13	12.47	9.40	6.90	5.71
3.35	3.06	3.08	3.02	2.60	2.66	2.77	2.78
0.110	0.135	0.158	0.151	0.135	0.173	0.216	0.239
926	928	925	926	924	926	927	931
5.83	4.25	5.4	5.4	5.24	5.60	5.08	4.50
0.69	0.75	0.72	0.75	0.73	0.72	0.72	0.73
702	703	701	704	705	705	703	701
1,066	1,065	1,060	1,066	1,062	1,063	1,066	1,059
31.31	26.22	17.84	20.59	19.84	21.26	21.60	21.15
904	903	900	904	†954	†953	†951	†956
0.203	0.322	0.308	0.357	0.490	0.247	0.319	0.344
3.09	2.31	3.88	3.42	2.75	3.18	2.91	3.19
98.97	97.73	96.98	96.61	97.67	97.32	99.86	100.73
87.9	92.6		44.8	60.9	73.8	56.2	58.2
51.33	50.53	54.33	68.22	58.89	57.11	54.20	49.9
0.115	0.134	0.130	0.215	0.185	0.198	0.238	0.199

approaching 20 cents per barrel due to the 28 per cent increase in yield of catalytic gasoline. This catalytic gasoline amounts to approximately 9 per cent gain in total gasoline for a typical refinery case.

The problem of how to make commercial yields approach those from the pilot plant depends upon many factors. Except for an increased amount of thermal cracking and poorer stripping in commercial operation, however, the yields obtained in the pilot plant were quite a satisfactory check on commercial operation; the octane numbers are well within the limits of error of the test.

As will be noted in Table 2, the stream recovery from the reactor is much different for the two catalysts. The effectiveness of steam and the high quality of catalyst are believed to account for the excellence of the yields shown by natural and indicates a potential which is worthy of careful consideration of any octane study.

References

1. Conn and Connoly, Indus. and Eng. Chem. 39, 1138 (1939).
2. Grote et al., ibid, 43, 545 (1951).

TABLE 7—RELATIVE ECONOMICS AT ARBITRARILY SELECTED UNIT VALUES

Catalyst—	Unit value per bbl.	Synthetic Barrels	Synthetic Value	Natural Barrels	Natural Value
Gasoline*	$5.25	7,095	$37,885	8,429	$44,250
Fuel gas	1.30	440	570	379	490
Cycle oil†	3.78	3,715	14,035	3,125	11,815
L.P.G.‡	2.73	1,584	4,315	992	2,710
Gross return			$56,805		$59,265
Differential per day					$2,460

*Includes poly gasoline and C_4's to 10-lb. R.v.p. †This figure equals the cycle oil less the amount of recycle returned for cracking and does not take into account any difference in boiling range as indicated in Table 3. ‡Includes excess C_4.

TABLE 6—SUMMARY OF OCTANE CALCULATIONS

Blending Pool Gasoline to 10-Lb. R.v.p.

	Synthetic Bbl. per day and R.v.p.	Synthetic Per cent	Synthetic F-1 octane clear	Synthetic F-1 blend value	Natural Bbl. per day and R.v.p.	Natural Per cent	Natural F-1 octane clear	Natural F-1 blend value
Catalytic cracking gasoline	5,459	40.3	91.4	96.0	6,846	46.5	89.6	95.0
	8.4				7.2			
C_4 to pressure	(147)				(319)			
Poly gasoline	1,610	11.9	96.0	101.0	1,264	8.6	96.0	101.0
	2.0				2.0			
C_4 to pressure	(208)				(164)			
Straightrun gasoline	4,000	29.5	65.0	65.0	4,000	27.2	65.0	65.0
	7.0				7.0			
C_4 to pressure	(213)				(213)			
Catalytic reformer gasoline	1,700	12.5	85.0	85.0	1,700	11.5	85.0	85.0
	2.0				2.0			
C_4 to pressure	(219)				(219)			
Total C_4 to pressure	787	5.8	97.0	97.0	915	6.2	97.0	97.0
Total	13,556	(100.0)			14,725	(100.0)		
Pool octanes			86.1				86.3	

Blending Pool Gasoline to 12-Lb. R.v.p.

	Synthetic Bbl. per day and R.v.p.	Synthetic Per cent	Synthetic F-1 octane clear	Synthetic F-1 blend value	Natural Bbl. per day and R.v.p.	Natural Per cent	Natural F-1 octane clear	Natural F-1 blend value
Catalytic cracking gasoline	5,459	38.9	91.4	96.0	6,846	45.0	89.6	95.0
	8.4				7.2			
C_4 to pressure	(330)				(546)			
Poly gasoline	1,610	11.5	96.0	101.0	1,264	8.3	96.0	101.0
	2.0				2.0			
C_4 to pressure	(269)				(212)			
Straightrun gasoline	4,000	28.6	65.0	65.0	4,000	26.3	65.0	65.0
	7.0				7.0			
C_4 to pressure	(370)				(370)			
Catalytic reformer gasoline	1,700	12.1	85.0	85.0	1,700	11.1	85.0	85.0
	2.0				2.0			
C_4 to pressure	(284)				(284)			
Total C_4 to pressure	1,253	8.9	97.0	97.0	1,412	9.3	97.0	97.0
Total	14,022	(100.0)			15,222	(100.0)		
Pool octanes			86.4				86.7	

- **Do retirement plans improve personnel relations?**
- **What are their real tax advantages?**
- **What benefits can they offer small as well as large companies?**
- **Can highly compensated executives participate equitably? In short . . .**

What's the Deal on Retirement Plans?

by C. R. F. Wickenden

PENSIONS and profit sharing are not the recent innovations they are generally thought to be. Actually they had their beginnings in the dawn of recorded times.

When able-bodied members of some ancient tribe first undertook to care for the sick and aged, the welfare and pension plan was born. When some primitive society first decided to pool its resources for the good of the group, the ancestor of modern profit-sharing plans came into being.

From such small beginnings a mighty concept has grown. By 1850, retirement plans which were prototypes of those we know today had been established in France as an outgrowth of the egalitarian spirit that prevailed in the wake of the French Revolution. By 1870, such plans had appeared in the United States.

The turning point in America occurred, of course, in the late 1930's and early '40's, when Congress enacted legislation exempting contributions to retirement plans from income tax, provided they fulfilled certain "qualifications." Since then, firms of every size, from smallest to largest, have been climbing on the retirement-plan bandwagon until today, assets of private plans total more than 22 billion dollars, and asset values grow at a rate exceeding 4 billion a year. Private and public plans (Social Security excepted) today cover some 22 million American workers—a third of the nation's working force—of which 1 million (or their families) are already receiving benefits.

Basically, this growth reflects current labor-management relations. As management's attitude has veered from the "hard" labor policies of the late nineteenth century, so acceptance of retirement plans and other fringe benefits has grown. Today, rank-and-file workers participate in such management-sponsored "extras" as group life insurance; health, accident, and medical insurance; incentive bonus plans; thrift and savings plans; paid vacations and sick leaves; company low-cost commissaries and cafeterias; company sports and outing programs; company-maintained recreation facilities, swimming pools, lodges, and vacation resorts—and of course pension and profit-sharing plans—nearly all of which would have been unthinkable at the turn of the century.

The author is president of C. R. F. Wickenden & Associates, Inc., New York, a firm of consultants and actuaries which during the past 20 years has been instrumental in establishing and supervising retirement plans for many companies in the oil and gas industry.

Labor-Relations Benefits

That fringe benefit programs produce harmonious labor relations is a matter of established fact. Reasons commonly cited by management for installing a retirement plan include the desire to establish a sense of security among employes—to provide assistance for them, or their families, in the event of death or total disability—to improve union relations, and to keep abreast or ahead of current trends.

Workers today have been educated to expect a basic minimum of fringe benefits, and feel discriminated against if they don't get them. Employers who do not offer such benefits have a built-in "sore spot." Their employes know other workers who are well covered, and wonder why they and their families are less fortunate, less secure.

There are corollary labor-relations benefits with financial overtones. For one, retirement plans effectively reduce employe turnover by giving added dollar value to each year of an employe's service. An employe with medium-term service is reluctant to terminate when by so doing he forfeits valuable seniority in his company's retirement program. He knows he can't pick up the lost years in a new employer's plan.

Well-balanced plans attract high caliber personnel whose special skills make them valuable assets. Today such employes have broad selection of employment opportunities. A skilled worker employed by a company with no plan loses nothing by transferring his employment to a competitor who maintains a sound one. It may actually pay him to make a change.

Retirement plans effectively provide benefits for death and total and permanent disability at costs far below insurance premiums for equivalent benefits. Plans have helped to avert strikes—have increased company efficiency by "clearing the decks" of over-age employes—have effected more and better production—have reduced waste—have built employe morale by providing an assurance of security in old age.

Financial Benefits

Labor-relations benefits alone justify the growing popularity of retirement plans—yet an equally significant factor in their growth is the economic advantages that accrue not only to sponsoring companies but to workers and executives as well.

In the early days of tax-exempt plans, executive benefits were severely limited. Today, however, most restrictions have vanished, and executives and other highly paid personnel are permitted to participate in Treasury-qualified plans in proportion to their full (non-discretionary) earned incomes. Such plans, therefore, now provide the most effective, efficient, economical method by which to accumulate deferred benefits for a highly compensated man.

Take as an example the case of a 45-year-old key executive whose top income is subject to a 60 per cent personal-tax rate. Over a 20-year period, a well-engineered retirement plan can accumulate for him over 400 per cent more net-after-tax income than dividends on his company stock provided from corporate earnings.

Say Typical Oil Corp. finds its top earnings subject to a 52 per cent corporate tax rate. If it allocates $100,000 to dividends, corporate taxes take $52,000 at the outset. A $5,000 dividend payable to our key executive (from 48-cent, after-tax company profit dollars) is subject to a 60 per cent personal tax loss. To provide him a net disposable dividend of $2,000 actually requires $10,400 of company earnings.

Each year this costly process must

be repeated. If our man invests his $2,000 net dividend in diversified taxable investments at 3 per cent each year until he is 65 (with no adverse experience, and assuming a continuing 60 per cent personal tax bracket), he comes out with $44,470 usable after-tax income. His loss arising out of personal taxes is $89,882 in the 20-year period.

But what is the total loss arising out of his personal taxes—plus the company's tax loss in that period? Believe it or not, a total loss of $234,982 has been sustained while accumulating $44,470.

Funds contributed by his company to a qualified retirement plan on his behalf escape corporate tax entirely. Neither are such contributions includable in his personal income in the years in which they are made. Earnings of the retirement trust fund, including capital gains in asset values, are tax exempt during the accumulation period. If, therefore, $10,400 of gross pretax corporate earnings were put to his credit each year for 20 years in his company's qualified retirement plan earning 3 per cent, he would accumulate $279,452 by age 65.

Since such accumulations are normally distributed as life income, he could retire on $23,214 a year for life, subject to income tax at considerably lower rates than in his working years, and to other tax advantages which apply in post-retirement years. There are certain circumstances, moreover, in which he may receive his $279,452 subject only to capital gains tax, leaving him a disposable after-tax accumulation of $209,589!

Investment Potential

Retirement funds may be invested in many ways to reduce company costs. Under Trusteed Administration, such funds have, with Treasury approval and with adequate security, built new plants or office buildings, have bought machinery, drilling rigs, porcelain-lined tanks, trucks, tools, and equipment used in company operations.

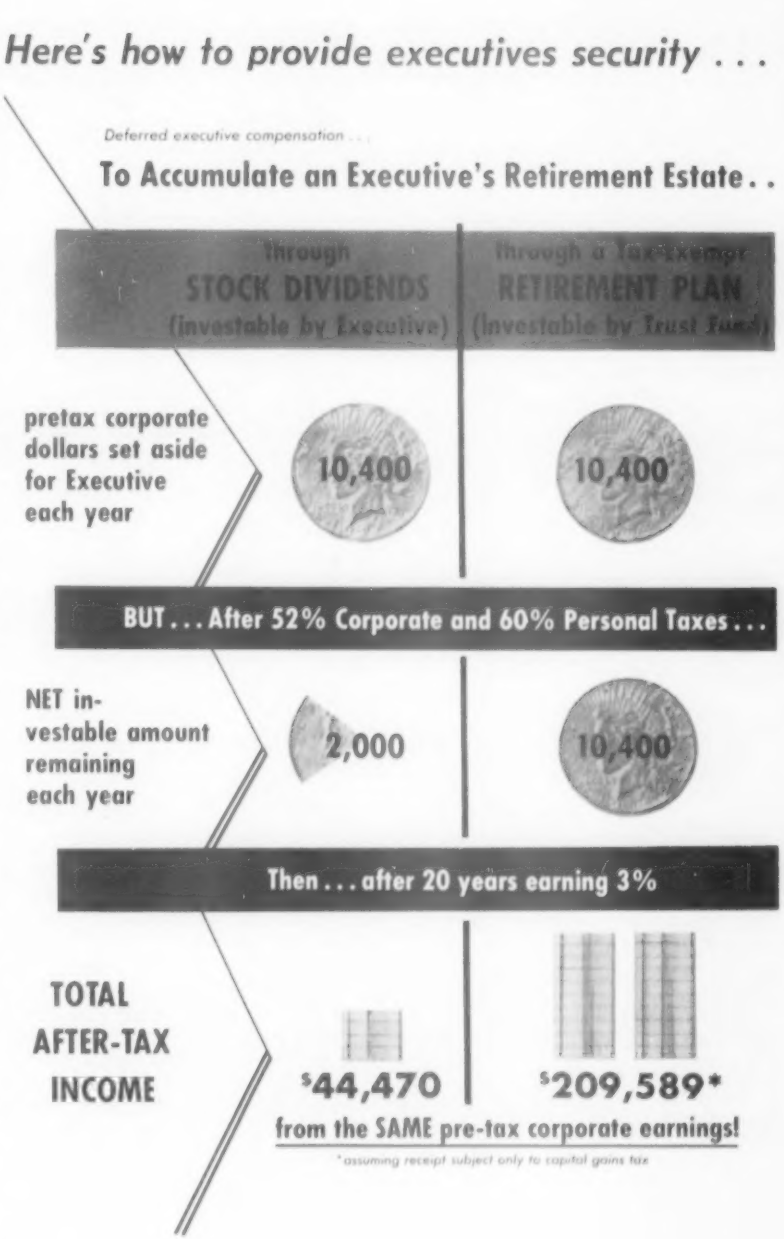
Leased back to the employer companies, these buildings and equipment have produced excellent rentals—often tax-free. Higher-than-average trust earnings thus produced drastically cut future plan costs or have permitted increases in benefit schedules.

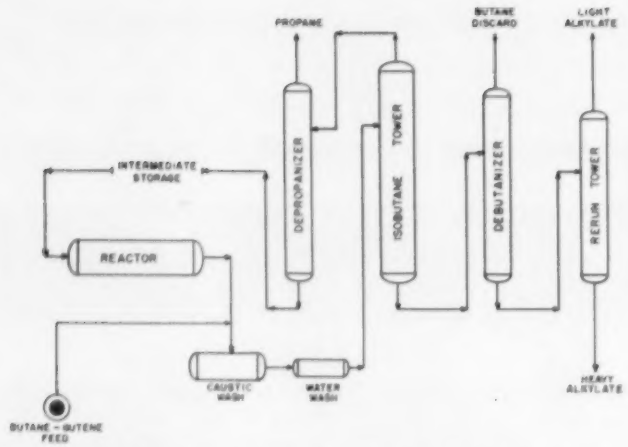
Applied in this manner, pretax corporate earnings comprising retirement fund assets replace capital otherwise required to finance corporate expansion and development programs.

A common misconception is that only large corporations can benefit from the good labor-relations effects and tax-relief provisions afforded by qualified retirement plans. This simply is not so. Broad advantages are available to the smallest concerns—if they are competently advised. In our experience, effective, successful retirement plans have been established for many companies in the oil and gas industry employing from 40 people to thousands.

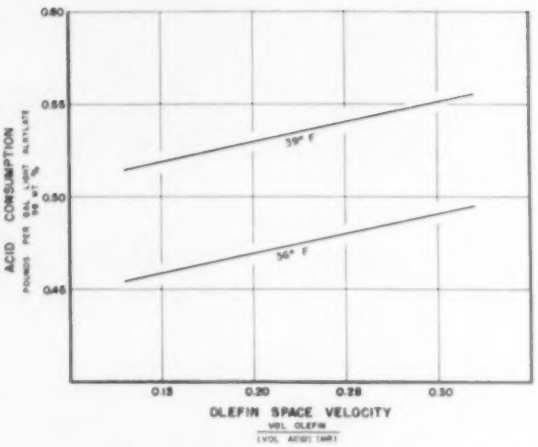
Actually, a sound retirement program may be of greater value to a small company than to a large one. A large corporation, because its size creates an impression of permanence, may be able to engender some sense of security among employes even without formal retirement provisions. A smaller company, however, to build a similar feeling of security, must offer a plan. A sound plan is a symbol of security, serving to reassure employes that they will have not only a job, but protection in case of death or disability, or genuine comfort in old age.

All things considered, the growth of retirement plans between 1940 and 1956 is not startling. More surprising is the fact that two-thirds of the nation's working force still participate in nothing more than Social Security. What, then, will the next decade bring? With labor increasingly well-informed—with profitable operation and high taxes expected to continue—we can anticipate that retirement plans will grow faster still, in number, in scope and in value of assets invested.


Here's how to provide executives security . . .
Deferred executive compensation . . .
To Accumulate an Executive's Retirement Estate . .
Through STOCK DIVIDENDS (investable by Executive)
Through a Tax-Exempt RETIREMENT PLAN (investable by Trust Fund)
pretax corporate dollars set aside for Executive each year
10,400
10,400
BUT . . . After 52% Corporate and 60% Personal Taxes . . .
NET investable amount remaining each year
2,000
10,400
Then . . . after 20 years earning 3%
TOTAL AFTER-TAX INCOME
$44,470
$209,589*
from the SAME pre-tax corporate earnings!
* assuming receipt subject only to capital gains tax



FLOW DIAGRAM, Utah Oil Refining Co.'s Salt Lake City alkylation unit. Fig. 1.



ACID CONSUMPTION, as function of space velocity and temperature. Fig. 2.

Two-Step Approach to Alkylation Efficiency

1. Detailed preventive-maintenance measures
2. Plant tests to establish yield factors and reduce acid consumption

by G. D. Borthick, L. V. Durland, and B. J. Pope

DETAILED preventive-maintenance procedures and plant tests on the alkylation unit at Utah Oil Refining Co.'s Salt Lake City refinery provide for more efficient operation as follows:

- The unit has a very high operating factor. This was 99.3 per cent during 1955.
- Alkylation yield factors are somewhat at variance with those established by the Aviation Gasoline Advisory Committee. Plant tests should be conducted for each commercial unit to establish these factors for economic evaluation.
- Acid-consumption studies show (1) if propylene concentration in the olefin stream is held below 30 volume per cent, propylene has no effect on consumption; (2) external ratio of isobutane to olefin should be at least 6:1; and (3) low reactor temperatures and low space velocities should be maintained.

Unit features . . . The company operates a sulfuric acid alkylation unit to produce aviation-grade alkylate. It is of the "jet" type with external emulsion pumps and has four reactors. The unit was designed for a nominal capacity of 3,100 bbl. per day of alkylate from mixed propylene, butylene, and amylene feeds. It was constructed by M. W. Kellogg Co. in 1943 as part of the defense-plant construction program during World War II.

Following World War II, alkylate production from Utah's feed stock was curtailed to the amount of butylene alkylation required to control motor-gasoline vapor pressure.

The production of the unit has been increased considerably during the past 5 years. Three reactors are being operated currently with light alkylate production rates exceeding 3,000 bbl. per calendar day.

Preventive maintenance . . . A program of preventive-maintenance work has decreased the frequency of major repair jobs. Piping and valves have been installed to permit removal of individual items of equipment for repair while the unit is in operation.

Efficient scheduling of operations and the keen interest of the operating personnel have resulted in excellent operating factors for the Utah unit (99.3 per cent for 1955).

How It's Operated

The operation of the alkylation unit generally is controlled by the availability of isobutane. The principal source of alkylation feed stock is a catalytically produced butane-butene stream. This feed stock must be fractionated prior to alkylation to provide reactor charge material with the proper ratio of isobutane and olefin.

The fractionation is achieved in the alkylation unit isobutane tower concurrently with the fractionation of the reactor effluent stream.

Process flow . . . The process flow for the unit is shown in Fig. 1. The B-B feed to the alkylation unit is mixed with the reactor effluent stream and the combined stream is caustic washed. The strength of the fresh caustic in the wash system is 10 wt. per cent. The caustic-washed material is water-washed and then is fractionated in the tower system.

The fractionation of alkylate in the rerun tower is controlled to produce a light alkylate with a distillation end point satisfactory for inclusion in aviation gasoline. Typical distillations of light and heavy alkylate are shown in Table 1.

Alkylation Yield Factors

A plant study of the alkylation unit was undertaken in 1951 for the purpose of determining yield factors for the butylene alkylation reaction. Unit

Authors are in research department, Utah Oil Refining Co., Salt Lake City.

TABLE 1—TYPICAL DISTILLATIONS OF ALKYLATE PRODUCT

	Aviation grade	Heavy alkylate
Gravity, °A.P.I.	69.7	52.3
A.S.T.M. dist. (SLC elev., 650 mm. Hg):		
I.b.p., °F.	125	353
10 per cent recovered, °F.	177	360
30 per cent recovered, °F.	202	366
50 per cent recovered, °F.	212	374
70 per cent recovered, °F.	220	392
90 per cent recovered, °F.	236	483
E.p., °F.	320	579
Recovery, per cent	98	98
Research octane, A.S.T.M.-D-908	96.0	82.3
R.v.p., psi.	4.0	

tests were performed at selected intervals to accumulate data under actual plant operating conditions. Each test was conducted under rather ideal conditions with respect to volume measurement of feed stock and products.

All feed and product streams were measured by accurately gaging storage tanks. It also was possible to measure, by tank gage, the intermediate products such as the isobutane recycle stream and the normal butane discard stream.

A single test was generally 24 hours in length. Two consecutive sets of data were obtained over a 48-hour period in some instances. This scheme was used to verify consistency in operation and to provide duplicate sets of test data. Composite samples of feed and product streams were taken over the entire period of each test.

Laboratory analyses were made with conventional low-temperature fractional-distillation equipment. The molal compositions were converted to liquid volume per cent by the use of published data on specific gravities.

The components consumed in alkylation were determined by the difference in the volume of each component charged to the unit and the volume of the same component in the product streams.

Program . . . The test program consisted of 35 separate unit tests which were made between June 1951 and September 1954. Data from all the tests were evaluated and statistical methods were utilized to eliminate test results which did not meet acceptable standards.*

The evaluation of the data has established that Utah's alkylation unit produces butylene-type aviation-grade alkylate on the basis shown in Table 2. Also shown in the table is the Aviation Gasoline Advisory Committee yield structure for butylene alkylation.

The A.G.A.C. yield factors were established in 1943 by the Technical Advisory Committee of the Aviation Gasoline Advisory Committee. Inquiries made in 1950 indicated that the A.G.A.C. factors were being used generally by the oil industry and that little plant testing had been done to verify the yields being obtained in alkylation units.

*Chauvenet's Theorem, Chem. Eng. 57:121 (1950).

TABLE 2

	Utah	A.G.A.C.
Volume isobutane consumed per volume of butylene	1.192	1.073
Volume total alkylate produced per volume of butylene	1.763	1.700
Volume light alkylate produced per volume of butylene	1.647	1.632
Volume heavy alkylate produced per volume of butylene	0.116	0.068

TABLE 3—RANGE OF OPERATING VARIABLES

	Maximum	Minimum	Weighted average
Acid consumption, lb./gal. L. A.	0.66	0.31	0.48
Spent-acid strength, weight per cent	90.9	87.7	89.3
Propylene in olefin feed, volume per cent	31.3	0	7.83
Reactor space velocity, $\frac{\text{Vol. olefin}}{\text{(Vol. acid) (Hr.)}}$	0.308	0.158	0.248
External ratio, vol. iC_4/vol. olefin	8.24	4.18	5.97
Reactor temperature, °F.	42	37	39

It can be seen from Table 2 that the isobutane consumption and the heavy alkylate yield for Utah's unit are higher than the comparable values given by A.G.A.C. Also a slightly higher yield of light alkylate is obtained per barrel of butylene reacted, based on these test data. However, the most significant relationship difference is seen in the comparison of light alkylate yield per barrel of reactants (isobutane plus butylene).

A ratio of 0.79 is calculated for the A.G.A.C. figures whereas the Utah relationship shows a yield of 0.75. This is a difference of approximately 5 volume per cent. The Utah yields are shown for butylene alkylation and represent a 98.2 per cent weight balance.

Limited test data with butylene feed stocks containing propylene up to 20 volume per cent of total olefins present in the feed indicate that the isobutane consumption for this type of feed is the same as the isobutane consumption for butylene feed.

Acid Consumption

The acid-consumption rate for butylene alkylation at Utah's unit could not be determined by the unit tests because of the short period of time of each test. Operating data over long periods of time were evaluated to determine the acid consumption at the unit.

The average acid consumption for a 2-year period (1953-1954) was 0.48 lb. of 98 weight per cent acid per gallon of light alkylate produced. This consumption rate was maintained with an average spent acid strength of 89.3 weight per cent.

Operating conditions . . . A study of plant data was made to determine the effect of operating conditions on acid consumption. Operating variables that could be controlled easily were chosen as a basis for studying acid consumption. These variables are (1) olefin space velocity in the reactors, (2) external ratio of isobutane to olefin in the reactor feed, (3) reactor temperature, (4) spent-acid strength, and (5) propylene content of the olefin feed to the reactor.

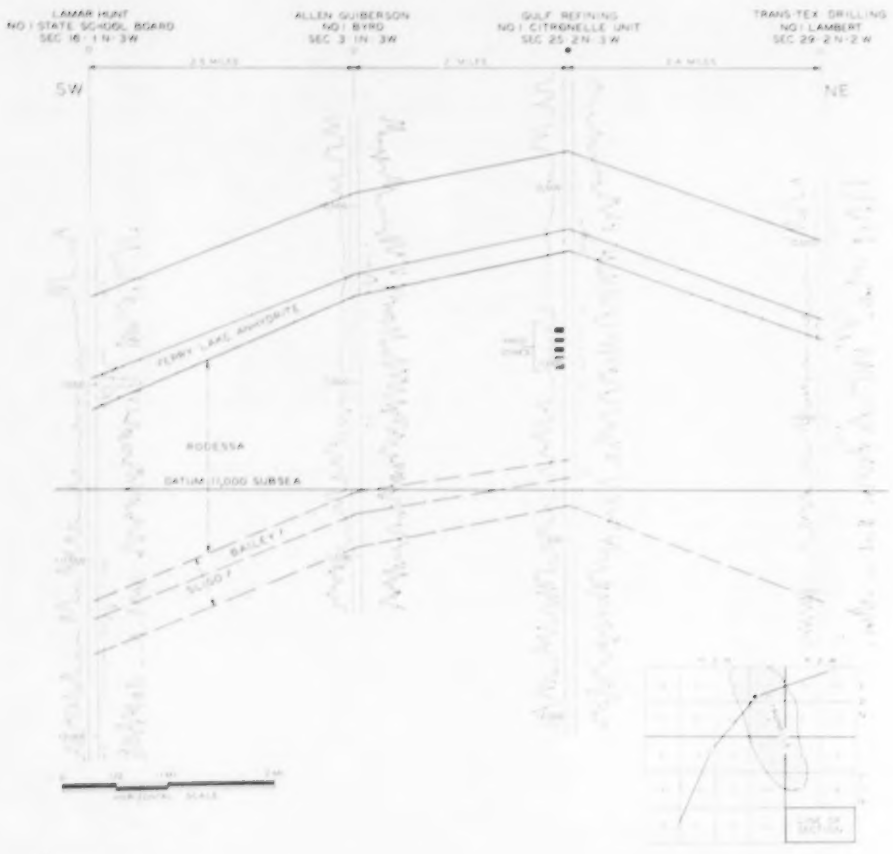
The investigation has shown that propylene does not have a significant effect on over-all acid consumption if the concentration of propylene is below 30 volume per cent of the total olefin present. Data are not available to evaluate the effect of higher propylene concentration.

The study also has served to emphasize the benefit of maintaining an external ratio of isobutane to olefin of at least 6:1. The work has verified the importance of maintaining a low reactor temperature and a low olefin space velocity. An increase in either of these variables will increase acid consumption.

The effects of these two variables are illustrated in Fig. 2. The effect of spent-acid strength on acid consumption was not found to be significant over the range of strengths observed (90.9-87.7 weight per cent).

Range of variables . . . The range of the operating variables which were studied is shown in Table 3. It should be noted that some of the variables, particularly spent-acid strength and reactor temperature, do not vary over a wide range. The olefin space velocity range represents light alkylate production rates of 637 bbl. per day to 1,240 bbl. per day per reactor.

Such factors as water content of the feed, sulfur content of the feed, uniformity of mixing, and type of butylene (isobutylene or normal butylenes) in the feed were assumed to be constant for the purposes of this work. Plant data indicate this is a reasonable assumption.



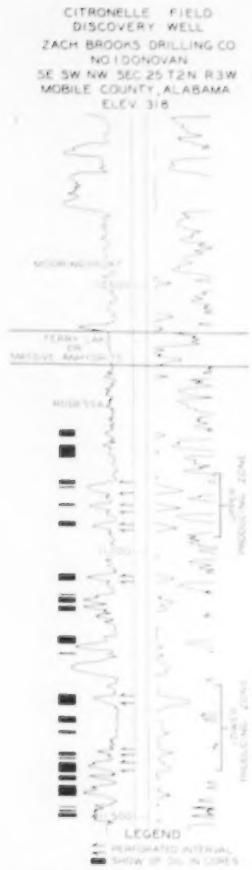
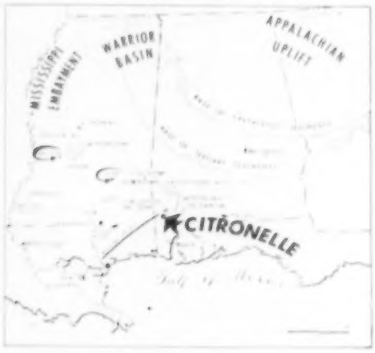


Fig. 1—(Left) Citronelle, 1955's discovery of the year, is a large anticline with nearly 1,000 ft. of structural relief. Production is from erratic sands in the Rodessa section. Fig. 2—(Right) The discovery well at Citronelle was dually completed from two zones in the Rodessa. The lower zone is missing in several wells in the field.

Both Structure and Stratigraphy Play Major Roles at Citronelle

Type of reservoir energy is still unknown, but drill-stem tests indicate an active water drive

by Norman S. Morrisey
Drilling-Development Editor



CITRONELLE, key discovery of 1955, is blossoming into the most important oil field in southeastern United States, but there are still many unanswered questions. Will it live up to early expectations? Will there be other fields similar to it uncovered in the near future? Can seismic work uncover fields like Citronelle, admittedly a subsurface discovery?

Development drilling has shown that the oil sands at Citronelle are erratic in thickness (Fig. 1). A well-developed sand in one well will be missing entirely in the offset. Another problem is that the sands even if present are often tight with low porosity and permeability. This is a common occurrence to operators who are drilling to shallow or even intermediate depths. But when the wells cost between $200,000 and $300,000 and the pay zones occur at 10,900-11,500 ft., the problem becomes more acute. Operators at Citronelle are actively campaigning for 80-acre spacing to insure a reasonable profit on their investments. State laws, however, set the largest drilling unit for oil at 40 acres in known fields. Recent legislation permits 160-acre spacing for wells deeper than 9,990 ft. if they are located in newly discovered fields. The new law specifically exempts all present fields and areas.

What controls production at Citronelle? Actually both structure and stratigraphy play a major role. Citronelle is a large, nearly circular anticline with at least 1,000 ft. of relief. Present data

indicate that the producing area will cover at least 5,000 or 6,000 acres.

The pay zones are sands in the Rodessa section that occur about 225 ft. below the base of the Ferry Lake or Massive anhydrite (Fig. 2). These sands are not continuous over the anticline, but are lenticular. The Rodessa zone itself is relatively uniform in thickness and persists for many miles along the depositional strike of the Lower Cretaceous beds. In some wells at Citronelle there are several separate sands present in the Rodessa section, but they are completed as a single zone. Engineers consider that these sands probably are interconnected because of the reservoir performance.

The type of reservoir is still unknown. Drill-stem tests lead the engineers to believe that the sands have an active water drive because downdip dry holes have recovered large volumes of salt water during drill-stem tests.

Discovery . . . The Citronelle discovery well, drilled by Zach Brooks Drilling Co., of El Dorado, Ark., was spudded in on July 3, 1955; it is located in SW NW 25-2n-3w. The well tested commercial oil production through drill stem on August 16, 1955, making 1,800 ft. of 45°-gravity oil and 180 ft. of oil and gas-cut mud through ⅜-in. bottom choke and ¼-in. top choke; tool was opened 8 minutes and 3,000 ft. of water cushion was used. Test was from 10,872 to 10,924 ft. The well was then cored to a total depth of 11,517 ft. Additional oil sands were penetrated, analyzed, and tested; 7-in. casing was set on bottom. The well was dually completed through parallel strings of tubing with the upper zone flowing and the lower zone requiring pumping equipment. On production tests, the upper zone flowed at the rate of 19 bbl. of 45.9°-gravity oil per hour through ¼-in. choke; the lower zone was completed pumping 103 bbl. of 41.8°-gravity oil per day. The gas-oil ratio tested 141 to 1 from the upper zone and 50 to 1 from the lower zone. The discovery well lies just outside of the Citronelle townsite.

The wildcat was the result of a very aggressive attitude taken by Gulf Refining Co. with help in the form of leased acreage and bottom-hole and dry-hole money from Magnolia Petroleum Co.; Gardiner Green, of Laurel, Miss.; Smith County Oil Co.; Southern States Oil Co.; Central Oil Co.; Superior Oil Co.; Sun Oil Co.; Seaboard Oil Co.; G. M. & O. Railroad; and T. K. Jackson, of Mobile, Ala.

The need for a deep test in the area was realized after the discovery of Soso field in Jones and Jasper counties, Mississippi, first commercial production from the Rodessa formation found in the general area. Five lower Tuscaloosa tests had been drilled in the Citronelle area and all proved the existence of a closed structure. The deepest of these was 9,100 ft. Also the position of Soso field and the position of the Citronelle structure were similar in that they lay on the perimeter of the South Mississippi salt basin. Unlike the blanket sands at Soso, however, Citronelle's production is found in a section where the sands thicken, thin, and vary considerably in permeability and porosity. The over-all productive section is less than that of Soso.

Geology . . . From the present control, the Citronelle structure (Fig. 1) appears to be a broad oval-shaped anticlinal dome with an axis lying north and south. However, there are three or more periods of structural disturbance and the shape may change with additional wells, especially to the west and northwest.

The Citronelle dome appears to be the result of:

1. The gentle downwarping of the Southeast Mississippi salt basin.
2. The abrupt subsidence of the Southwest Alabama salt basin.
3. The effect of a hinge line which separates the Mississippi and Alabama salt basins from the recent submerging of the Alabama-Mississippi Gulf Coast.

This hinge line is generally spoken of as the Wiggins anticline and its highest point appears to be the Citronelle structure. No faulting has been detected to date in the electric logs; however, there are surface faults that probably indicate shallow east-west grabens, unimportant to the deeper formations.

Pay zones . . . The producing section in the discovery well which was drilled on the Donovan tract carried oil sands through an interval of 540 ft. The five uppermost oil sands in the 1 Donovan carried oil. The next three underlying sands carried salt water and the next five sands carried oil or appeared to do so from the various coring and testing information. Those sands above the salt-water zone are called the upper zone and those beneath are spoken of as the lower zone. The porosity through the upper zone averages 16 per cent, and the lower zone averages 15 per cent. The permeability averages 87 md. in the upper zone and 28 md. in the lower zone.

At the present, there are 14 wells either completed or proven productive. Four of these are offsets in each direction from the discovery well; two of the producers are approximately 2½ miles south and evidently are on or near the axis of the structure. Four dry holes have been drilled; three of these were well off the structure being at least 100 ft. lower than the discovery well. None of these wells, how-

Table 1—Drilling Data, Citronelle Field, Mobile County, Alabama

Location: Disc. well—25-2n-3w, Mobile County
Pay zone: Rodessa
Total depth (average): 11,400 ft.

Normal rig time distribution (average):

Days on footage rate	35
Days on day work rate	10
Total days (spud to rig release)	45

Cost data:

Footage price (average)	$ 5.25
Day work rate with drill pipe (average)	950.00
Day work rate without drill pipe (average)	850.00

Bit data (average):

Total number of bits	30
Feet per bit (average)	160

Water supply: Creeks:
Usual fuel: Butane
Terrain and roads: Rough terrain—graded and board roads.

Casing program (average):

	O.d. (in.)	Casing seat (ft.)	Cement (sacks)
Surface	10¾	2,000	
Oil string	7	11,500	1,000

Geological data (average):

Drilling depth (ft.)	Formation
0-4,500	Eocene, including Wilcox and Midway
4,500-5,750	Upper Cretaceous Chalk section
5,750-6,500	Eutaw and Upper Tuscaloosa formation
6,500-6,900	Marine Tuscaloosa
6,900-7,350	Lower Tuscaloosa
7,350 Average	Top of Lower Cretaceous
7,350-9,800	Danciger group and Paluxy
9,800-10,500	Mooringsport Lime and Sand section
10,500-10,700	Anhydrite (20-40 ft. solid anhydrite)
10,700 to total depth	Rodessa section*

*The Rodessa section from 10,700 to 11,500 ft. may eventually be found to be equivalent to the Rodessa, Pine Island, and Sligo formations of North Louisiana.

ever, had a satisfactory development of porosity in the upper sand zone and as a result no water level in the upper zone is apparent to date. There are eight rigs running in the area, two drilling for Gulf Refining Co., two for Brooks Drilling Co. interests, one for Trans-Tex Drilling Co., and three drilling for George Brown, Gardiner Green, and others. The present footage rate is at a cost of $5.25 per ft.; 2,000 ft. of 10¾-in. is set for protection string; 7-in. casing is run to total depth except in one case where 5½-in. was used; both 2 and 2½-in. tubing are used.

The lower zone in the discovery well is erratic in distribution, but is producing in three other wells. In the one well using 5½-in. casing, the operator set pipe on top of the upper main producing sand and completed in the open hole.

The oil production at Citronelle is trucked from the field to Gulf Refining Co.'s Mobile terminal, where it is barged down the Gulf Coast to its refinery. Thirty cents per barrel is charged for trucking; $2.95 per barrel is paid for crude from the upper zone and $2.80 for that from the lower zone. What the pattern of production will eventually be, or how extensive an area it will be, can hardly be estimated or predicted due to the lack of a known water table and the erratic sand deposition and development.

Exploration . . . Citronelle lies along the "fairway" of the important Lower Cretaceous fields in southeastern United States. This belt now extends from Bolton on the northwest to Citronelle, the most southeasterly field, a distance of 160 miles. Along this trend, conditions appear most favorable for Lower Cretaceous production, particularly from the Rodessa formation. Updip to the northeast, the Lower Cretaceous beds grade from a marine facies to a nonproductive continental facies. Downdip the sands become finer grained and gradually change to shales and limestones. For these reasons, oil companies have concentrated their exploration efforts along the Bolton-Citronelle trend, but recent Lower Cretaceous discoveries at Ansley and Pistol Ridge-Maxie have expanded the area of interest considerably.

Although 30 seismic crews are active in Mississippi, only one of the Lower Cretaceous discoveries to date can be credited directly to the seismograph . . . and that is Bolton. The others have been largely or entirely the result of subsurface geology, in most instances based on shallower Upper Cretaceous leads. The larger Lower Cretaceous fields like Citronelle and Soso are evident in the Upper Cretaceous beds. As a matter of fact, Soso has production from the Eutaw and Tuscaloosa formations, both Upper Cretaceous in age.

Until recently, the main pay zones in both Mississippi and Alabama were Upper Cretaceous sandstones in the Eutaw and Tuscaloosa. Seismic efforts were aimed at mapping these horizons, or a horizon as near to them as possible. In many instances, no effort was made to get Lower Cretaceous reflections. Similarly, wildcats seldom penetrated the deeper beds if the well tested dry in the Tuscaloosa. Even today, there are probably fewer than 30 wildcats along the fairway that have tested the Rodessa section. As a consequence, little is known about the details of the Lower Cretaceous stratigraphy. Comparison with North Louisiana and East Texas would indicate that the oil possibilities of Mississippi and Alabama are excellent. Citronelle helps to confirm the conclusion.

Fields like Citronelle and Soso present a real challenge to the geophysicist because they are low-relief structures at depths of 10,000 ft. or greater. The usual problems of seismic mapping are intensified because of rapid facies changes up and downdip, lack of reliable mapping horizons, and lack of well control. In spite of these obstacles, geophysicists are confident that they can find similar structures. The results of the present intense seismic campaign will not be felt for 2 or 3 years, but the future will definitely see more fields like Citronelle, or even better.

Acknowledgment

The author wishes to express his thanks to Everett Eaves, consulting geologist, Shreveport, for his assistance. Eaves is credited with the original geological work on which the discovery well was staked.

Here's how costs were cut by

Drilling a Crooked Hole Intentionally

by Fred Norris

Actually, this 15,000-ft. Oklahoma wildcat was a slant hole. Hole was bottomed 962 ft. away from surface location. Liberal deviation limits helped speed penetration rates in the highly dipping beds. Negotiated contract allowed contractor minimum rig operating costs regardless of drilling time, but provided a bonus for fast drilling.

DRILLING of the 2 Harrison well in Carter-Knox field, Grady County, Oklahoma, is an example of "slant-hole" drilling to reduce drilling costs. This was an attempt to get to the deep Simpson sand at a reasonable well cost. The objective was realized chiefly because of the type of drilling contract and the realistic deviation requirements.

Fast drilling was encouraged by the allowable 1° deviation per 1,000 ft. of hole. But the safety of the hole was maintained by the requirement that the course of the hole could not change more than 1½° over any 100-ft. interval.

. . . Main features of the contract were to allow both contractor and operator to share in either profit or loss caused by failure of penetration rate to conform to the agreed estimated rate. In this way, contractor would make no profit if drilling time was beyond a certain limit. But he would be compensated for actual rig-operating costs. In the event drilling was faster than estimated, contractor would get a bonus and both contractor and operator would share the profit.

Use of this type of contract eliminates the cost that the drilling contractor usually adds for insurance against hard digging, hole loss, and other risks except fishing jobs. Use of the slant-hole drilling technique with relaxed deviation requirements as described here results in lower drilling cost per foot because of increased penetration rates that result from greater weight on the bit.

Slant-hole drilling . . . Before this well, other operators as well as British-American had drilled wells into the Springer formation, some as deep as 13,000 ft., at relatively high drilling cost. A large

Author is with British-American Oil Producing Co., Oklahoma City. Paper presented under the title of "Two Contract Features That Promote More Economical Drilling" at the 1956 spring meeting of the Mid-Continent section of the A.P.I. Division of Production.

THE BRITISH-AMERICAN OIL PRODUCING COMPANY

P. O. Box 3187
Oklahoma City, Oklahoma
April 20, 1955

Big Chief Drilling Company
P. O. Box 8837
Oklahoma City 14, Oklahoma

Gentlemen:

This is a request for a bid to drill our Harrison #2 well, to be located in Section 29-3N-5W, Grady County, Oklahoma. We propose to drill this well to 13,500 feet or to the Oil Creek formation. The well is to be spudded not later than June 1, 1955, and we ask that your bid be in our office by May 10, 1955.

We would like to have a footage price to drill a 9-7/8" hole to 12,500 feet or to the top of the 1st Bromide, if found at a lesser depth, and/or one or more alternate proposals which you may have. If an alternate proposal is submitted, please advise hole responsibility and fishing time as part of the conditions. We assume, of course, that the well will be drilled from the 1st Bromide to total depth on day work.

We request that Contractor specify surface location so as to hit target area shown on attached plat, with a maximum allowable hole deviation of one degree per 1,000 feet. Our preferred target would be the center of the forty-acre tract. We also request that Contractor give rig specifications he proposes to use, including drawworks size, number and kind of engines, and make and model number of pumps.

British-American will furnish road, levelled location, mud and mud conditioning materials, oil to maintain 10 per cent emulsion from top of the Springer to total depth, Monel drill collar, and single shot directional survey instrument. We will also furnish an engineer to calculate and maintain charts of horizontal and vertical hole plan.

The following information may be useful in compiling your bid:

Estimated Total Depth 13,500'

Estimated Top 1st Bromide 12,500'

Gas available from State Fuel Supply Company from a line running north and south on the east side of Section 28. Their approximate rates are: $1.00 for the first 1,000 cubic feet, 50 cents for the next 49,000 cubic feet, 30 cents for the next 150,000 cubic feet, and 15 cents for all over 200,000 cubic feet per month.

Water is available from Rush Creek.

We are attaching:

1) Drilling Data Service form on our Harrison #1 well.

2) Cross-section showing formations and dips.

3) Plat showing desired target with allowable target area. The formation dip is South 60 degrees, West.

If any additional information is desired, please advise.

Yours very truly,

Fred Norris
District Superintendent

FN:c
Att- (3)

BID INVITATION offered the contractor the maximum information about drilling in the wildcat area. Drilling-data form provided drilling rate and formation log for a previous 8,000-ft. wildcat. Geological cross-section gave a picture of the formation dip and structures to be expected.

part of the total cost was due to attempting to drill a low-angle deviation hole.

British-American's previous experience with slant-hole drilling in highly dipping formations in the Rocky Mountain area, showed that this was a possibility to speed up the drilling of the 2 Harrison well, a proposed 13,500-ft. Simpson sand test. Discussed here are only the unusual parts in the type of contract and drilling.

Bids . . . The contractors requested to bid on this well were furnished with (1) a plat showing the target area, (2) a cross-section showing the formations and dip, (3) the direction of the dip, (4) the depth and size hole to be drilled, (5) the type mud to be used, (6) a copy of a Drilling Data Service Report on a wildcat well drilled to 8,026 ft. in the same quarter section, and also (7) a regular form contract setting out what British-American would furnish and defining responsibility for the hole. The contractor was requested to advise where he desired the surface location.

This bid request was sent to several contractors with the request that they either give a footage bid to the top of the Bromide or one or more alternate proposals. A rate-of-penetration type contract with Big Chief Drilling Co. was chosen and details of the contract were worked out later.

It was agreed the well would be moved approximately 1,000 ft. down-dip. The operator then went to the Oklahoma Corporation Commission and obtained permission to directionally drill this hole. The hole was bottomed 962 ft. northeast of surface location, this being 88 ft. west and 97 ft. north of C NE NE 29-3n-5w, which was the ideal target point. This hole was drilled without setting any whipstocks and was controlled solely by the use of weight and r.p.m. on a day-to-day basis.

Nature of Contract

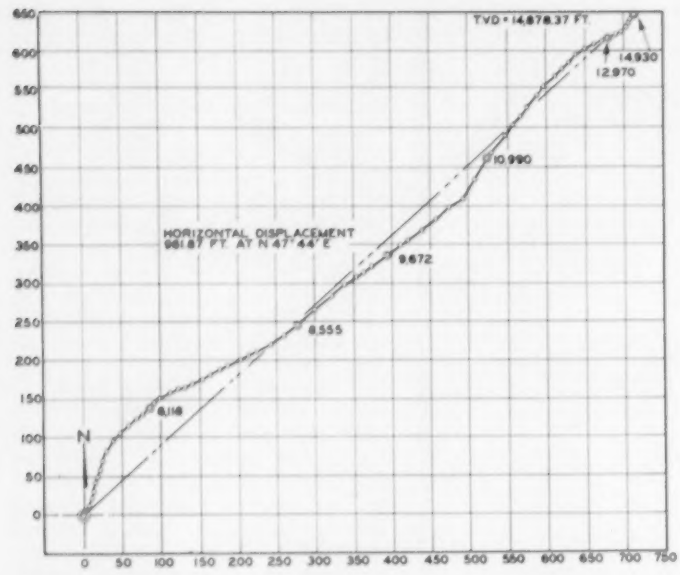
Here is an example of how this type of contract is worked out on a hypothetical well:

Assume this hypothetical well is to be drilled to 10,000 ft. and that the agreed estimated drilling time is 100 days. Also assume that a rig of this size should have an average income of $1,200 a day to drill this if normal time is required.

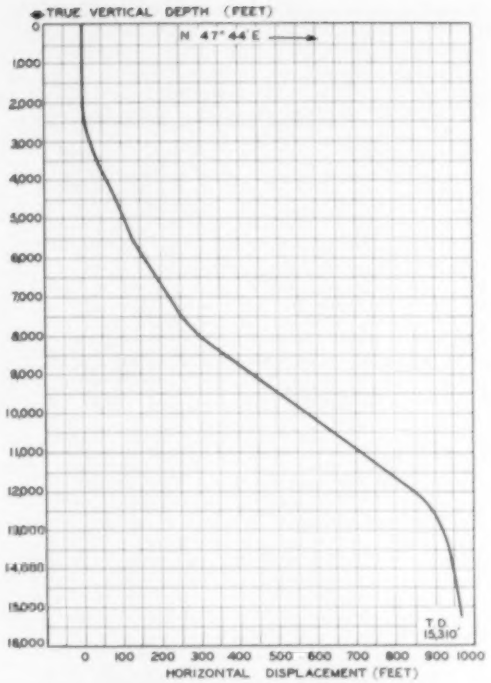
The contractor would then be asked to give operator a minimum rig rate which probably would preclude profit and some depreciation and overhead, in the event it should take longer than the expected normal time. This would be about $1,050. The operator would then offer a bonus if the contractor should reduce drilling time, usually in the order of $100 a day.

From these data the average footage price can be calculated. This would be $1,200 a day times 100 days divided by 10,000 ft., or $12 a foot. Now, in the event it should take a longer period, contractors' daily income would be reduced. But the lowest it would go would be to $1,050 a day. To find the time at which this rate would apply, take the $1,200 a day multiplied by 100 and divided by a minimum rate of $1,050. This gives 114 days. In order to find the lowest number of days at which the full $100 bonus would apply, take the same cost and divide by $1,300 a day which gives 92 days.

From these data the contract is written that company shall pay the contractor $12 a foot provided the well is drilled between 92 and 114 days. In the event 114 days or longer is re-



WELL LOCATION chosen by contractor was 1,000 ft. downdip from desired hole bottom to take advantage of natural drift. Without using whipstocks and still maintaining contract deviation requirements, contractor hit within 40 ft. of target.



SLANT HOLE drilled fast because of the allowable deviation of 1° per 1,000 ft. Slope was smooth, however, to satisfy the requirement that the course not change more than 1½° over any 100-ft. interval.

quired, contractor's income would be the total drilling days, exclusive of day work, fishing, etc., multiplied by $1,050. If 92 days or less is required, his income would be $1,300 a day for net drilling time.

Essentially, this contract is prenegotiated as to maximum and minimum rates and is generally used only for wildcat or semiexploratory wells. The operator does everything deemed practical to help increase the rate of penetration and it goes without saying that as long as this type of contract is used it is sincerely hoped the contractor is able to earn his bonus. Of course, the rig rates and drilling time are agreed to by operator and contractor before the well is started.

Deviation

British-American's contracts of this type provide for deviation from vertical of 1° per 1,000 ft. of depth penetrated with the provision that the rate of change shall not exceed 1½° in any 100 ft. of hole drilled. In order to provide for both increasing and decreasing rate of change, this requirement is worded as follows:

"Should the hole have an angle of deviation from vertical exceeding 1° per 1,000 ft. of depth attained after surface casing is set or a horizontal departure from a tangent course of more than 2.6 ft. per 100 ft. of drilled hole, contractor agrees, unless this requirement is specifically waived by company, to:

(a) Reduce the excess deviation or reduce the rate of change of angle of deviation to the above limitations, or

(b) Plug back to a point designated by company and redrill said hole at contractor's sole cost and expense.

"The foregoing limitation of rate of change shall not be applied in case of whipstocking approved by company."

It is further provided that deviation surveys shall be run at regular intervals usually not exceeding 90 ft. It is set out that British-American shall furnish monel drill collar and single-shot directional-survey instrument.

Faster drilling . . . Close deviation control actually speeds up drilling operations due to ability to carry more weight on the bit. In some wells drilled in this general area, surveys have been made at intervals as close as 30 ft. This is usually in highly dipping beds where weight normally is reduced to exceedingly low values—3,000 to 8,000 lb. It is believed that close-interval surveys sometime allow penetration rate to increase as much as 25 per cent.

Drilling

Prior to actual moving in and spudding the 2 Harrison well, a conference was held between operator and contractor which also included service companies which were to be used as drilling progressed. It is certainly felt that the understanding arrived at by discussing all features in a conference helps speed operations on a day-to-day basis. The proposed mud program, deviation surveys and equipment, and the various techniques to be used while drilling were reviewed at this conference.

Perhaps the most important part is the understanding that everyone has of the problems of others after such a conference, particularly those of the tool pusher and the drilling engineer or drilling foreman.

Another procedure used on this well was that after 16-in. conductor was set, a 9⅞-in. hole was drilled to approximately 9,200 ft. before reaming and the setting of an intermediate string of casing. This was done because some wells in this general area had had key seats develop between 3,500 and 4,500 ft., and a limited amount of 10¾-in. casing was available for an intermediate string.

No key-seat trouble was encountered in drilling to 9,200 ft. Therefore the top section of the hole was reamed and 10¾-in. hole was then drilled to 14,940 ft. where coring started with a 7¾-in. diamond core head. After 53 ft. of core was cut, blowout and then lost-circulation conditions developed with the core barrel in the hole. When the well was under control, a string of 7-in. casing was run and cemented at 14,008 ft. Coring and drilling then continued to total depth of 15,310 ft. Then 5-in. liner was run and cemented 60 ft. off bottom and the well was completed in this open-hole section.

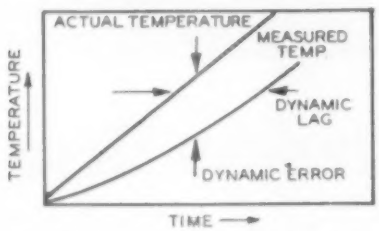
ELEMENTS OF FIELD PROCESSING—15

Oil-Field Instrumentation—How Controllers Work

by Paul S. Ache* and John M. Campbell†

PURPOSE of the automatic controller is to prevent deviation of a process from a desired standard. This may be accomplished by various modes of control action, each of which incorporates a distinct limit range, and speed of correction.

Choice of modes depends on the frequency and magnitude of the process load changes, the degree of control needed and the dynamic lag inherent in the process and controls used.



Proportional control . . . This is the basic action that is employed in all controllers not using snap (on-off) action. It is defined as control action in which a continuous linear relation exists between the value of the controlled variable and the position of the valve. The ratio of change of pilot pressure or electric current to a unit change of the controlled variable is the sensitivity:

$$dP/dt = S\,(dy/dt) \qquad (1)$$

where:

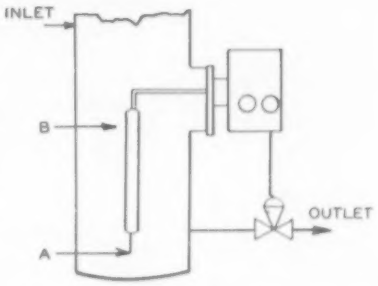
dy/dt = rate of change of the controlled variable with time (level, pressure, etc.)

dP/dt = rate of change of pilot output pressure or current signal with time

S = characteristic sensitivity constant of the pilot relating output to input

The proportional band or range, expressed as a percentage, relates the percentage of the full range of the measuring means that the controlled variable has to traverse to fully stroke the valve. This may be illustrated by the figure at top of next column.

This represents a typical level-control application utilizing a displacement-type controller, i.e., one which does not float on top of the liquid but depends on the varying buoyancy of the liquid as the level changes. Consequently, the control range is the distance between points A and B. When the level is below A or above B, a change in level has no effect on the buoyancy of the float.



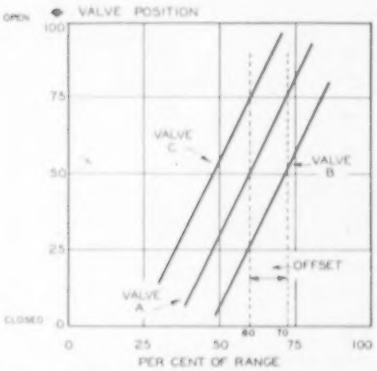
Therefore, at 100 per cent proportional control the level would have to move from A to B, or vice versa, to fully stroke the valve from full open to closed. At 25 per cent, a level change of 25 per cent of the distance A to B would fully stroke the valve. The same principles apply with all other modes of control.

Example: A back-pressure controller with a range of 0 to 100 psig. is set at 50 per cent proportional control, using a normally open valve. If the valve is open at 100 psig., (a) at what pressure will it be fully closed, and (b) what is the opening at 75 psig.?

Solution: The control range is 100 psig. which at 50 per cent proportional control means that a (0.50) (100) = 50 psig. change will fully stroke the valve; therefore it is fully closed at 50 psig. At 75 psig. it would be half open.

Control of flow . . . The amount of fluid that a valve will pass at a given position depends on the size and characteristics of the inner-valve assembly. Ideally the amount of fluid passed under given conditions, with a given valve, should be directly proportional to the valve opening. Often it is not, however, so that the type of inner valve has a definite effect on the proper proportional setting. Also ideally, the diameter of the inner valve should be such that the range of anticipated process loads may be handled when the valve is between 25 and 75 per cent open. In the final analysis, the choice of the proportional band for a given installation must be governed by experience and adjustment on the job.

This is illustrated in Fig. 1. The slope of the lines depends on the proportional band used, each line representing a valve of given size. Under these conditions each valve may operate only along a single line, in accordance with Equation 1.



SIZE AND CHARACTERISTICS of inner-valve assembly determine amount of fluid a valve will pass at a given position. Fig. 1.

If the instrument were set to control at 60 per cent of the range, valve A would be 50 per cent open, valve B would be 25 per cent open, and valve C would be 75 per cent open.

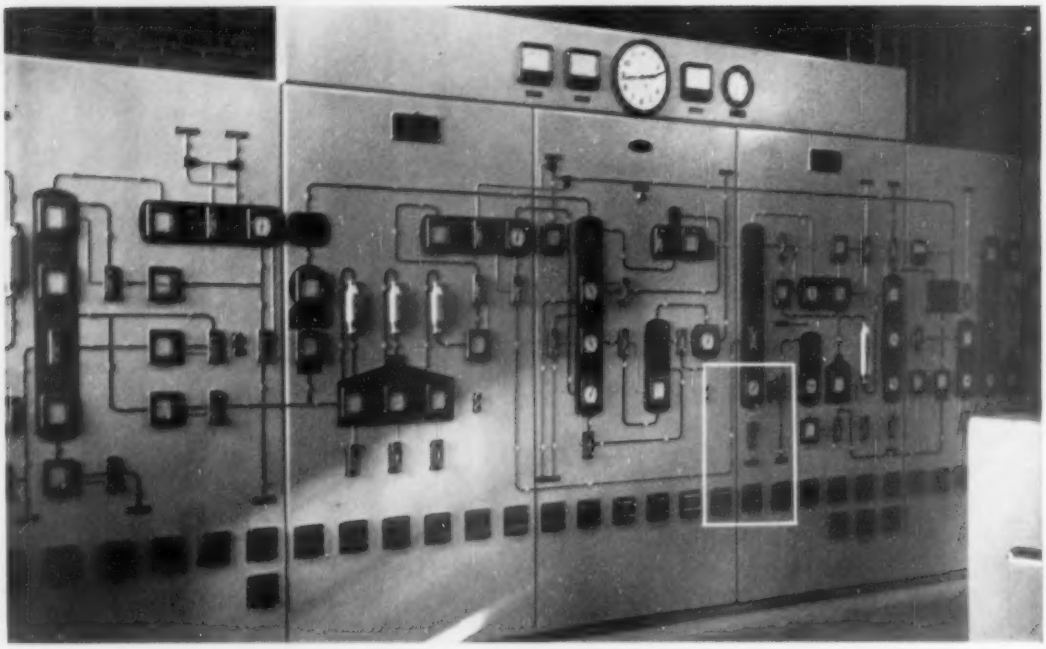
Suppose, however, that an instrument set to operate along line A is in liquid-level service and the flow rate through the vessel increases such that a valve opening of 75 per cent is needed to maintain the level. According to line A the only way the proportional controller can provide this opening is for the level to be at 70 per cent, or 10 per cent above the set point. This 10 per cent is called offset.

Consequently, with proportional control alone a change in process load brings a change in the valve position and some change in the liquid level. This proper proportional setting is therefore one which makes the lines in Fig. 1 as near perpendicular as possible.

Zero per cent proportional control represents a special case. It is the upper limit of a range where the liquid level is controlled by the valve alternately opening and closing. This is normally called snap action or on-off control. At a given snap setting the valve will stay closed until the level reaches a certain point between A and B and then remain full open until the level drops to the control point. Where rapid process load changes are encountered, such as surging flow through separators, snap action is normally recommended.

*Graduate assistant, University of Oklahoma; present address, Shell Oil Co., Houston. †Department of petroleum engineering, University of Oklahoma, Norman.

FIELD PROCESSING



GRAPHIC PANEL control board for Platformer and Unifining unit at Frontier Refining's Cheyenne refinery. At far right is an enlargement of the indicated area of the graphic panel showing the relationships between level indicator, manual controller, and automatic controller.

Electronically Controlled Units Give Good

by D. L. Glaser

ON December 20, 1955, a completely electronic control board was placed in operation at Frontier Refining Co.'s Cheyenne, Wyo., refinery. The startup was without incident with respect to instrument operation and subsequent operation has proved that the system is performing well.

This system consists of Swartwout Autronic control equipment on all process controls of a U.O.P. licensed Platformer and Unifining unit. The Unifining unit is unique in another respect in that it is the first unit to desulfurize a feed stock which is a catalytic cycle stock having the characteristics of a No. 2 fuel oil and being marketed as diesel fuel.

Author is engineer, Frontier Refining Co., Cheyenne, Wyo.

The Unifining unit is a 3,000-bbl. per stream day unit which uses the net hydrogen from the Platformer at the rate of 300 cu. ft. per barrel of charge stock to desulfurize the charge from 1.2 to 0.05 per cent sulfur. Improved cetane number, color, and storage stability are also realized.

Control Setup

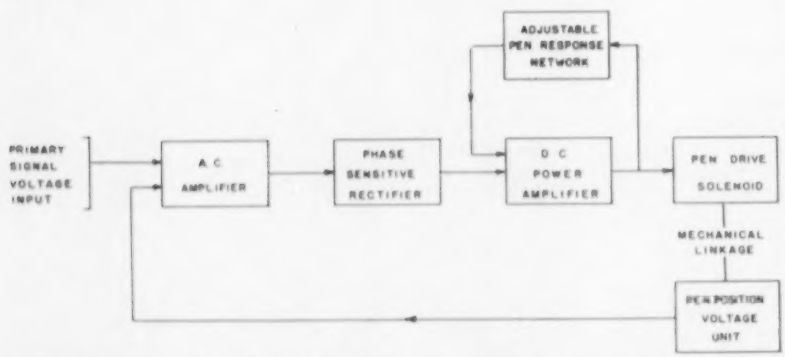
The controls are arranged on a graphic-panel-type board in conjunction with which there is an operator's desk which contains a Brown single-range electronic temperature indicator. This desk was fabricated from a standard steel executive-type desk with color scheme that matches the control board.

The recorders and controllers "plug in" to the mounting frame and when in operation are flush with the front of the panel board. The plug in feature permits rapid replacement in the event of failure. Due to the fact that the basic design and operation of all the units is the same, a much smaller inventory of spare parts is required.

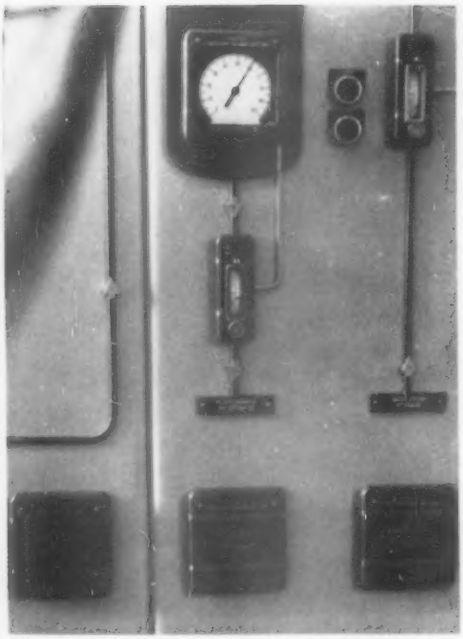
In addition, most components of the instruments are readily available in local radio and television shops. The ruggedness of construction is in direct contrast to other recorders and controllers. This ruggedness is due mainly to the lack of small, delicate moving parts in the instruments.

"Freeze-ups" and such other typical pneumatic installation problems are a thing of the past.

The control systems are set up in such a fashion that the various components can be repaired without affecting the operation of the remainder of the network. This can be illustrated



CONTROL SYSTEM diagram showing how primary signal is compared with corresponding pin position. Fig. 1.



Performance

Platformer and Unifining unit instrumented with completely electronic system have few control problems, come on stream rapidly and surely after shutdown or turnaround.

by removing the manual-control components of the system while the automatic system continues to function.

How it works . . . The control system operates on the principle of converting a variable of flow, pressure, level, etc., into an 0-0.5-volt 60-cycle signal, recorder, and controller. At this point, the primary signal is compared to the set-point signal and the difference in the voltages is the basis on which the process is controlled.

The differential voltage is sent through a combination of rectifiers and amplifiers which contain the adjustable proportional band networks, rate networks, and reset networks. The control output is then sent to a transducer which translates the electrical signal into a proportional pneumatic pressure for operation of conventional control valves.

Referring to Fig. 1, the signal to the recorder is a zero to 0.5-volt a.c. signal which is proportional to the measured primary value. A second input is pen position voltage. Both voltages are fed into an a.c. amplifier which amplifies the difference between the voltages. This signal then goes to a phase-sensitive rectifier which produces a voltage that is proportional to the difference between the input voltages.

The output of the phase-sensitive rectifier controls the output of a d.c. power amplifier which drives the pen through a rotary-type solenoid. This solenoid is spring loaded so a direct current causes it to turn one direction and the spring causes it to move in the opposite direction.

Pen movement . . . The high amplification of the system provides a considerable force to cause the pen to move to a null position whenever the input voltages are not of the same value. The pen response is controlled by a feedback network which reduces the amplification of the system.

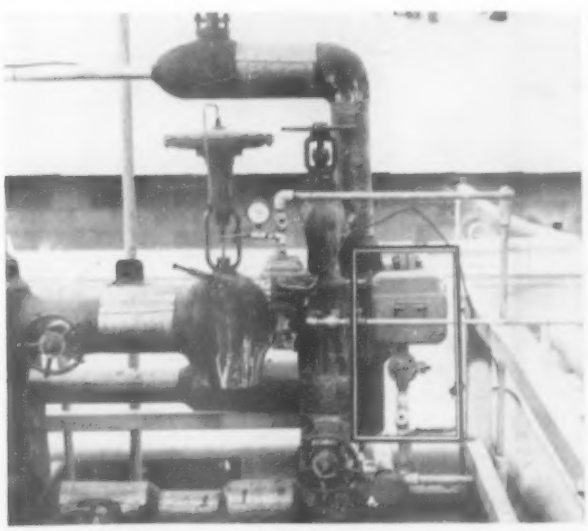
The set point of the recorder is mechanically connected to a differential transformer so that the output from the set-point system will vary from zero to 0.5 volt in proportion to the set-point reading.

The recorder carries a 31-day chart and provision has been made for daily tear off of the sheet when desired. The chart is driven at 1 in. per hour which leaves 3 to 4 hours of record visible. The pen is operated by a servo-powered, null-balance circuit and the pen response can be adjusted to smooth out pulsations which would tend to make chart reading difficult.

The entire past record on the chart may be examined at any time without interfering with the recorder. The recorder may be speedily removed for servicing or it may be replaced by an indicator.

Controller operation . . . All controllers, as shown in Fig. 2, operate in a similar manner in that the signal voltage input from the primary element transmitter and the set-point voltage input are both connected to the a.c. amplifier which has a fixed amount of amplification. This means that small differences in the input voltages are amplified considerably and are proportional to the differences in input.

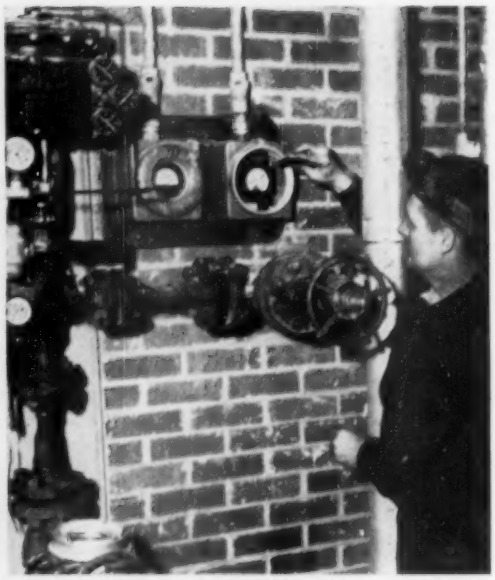
With an adjustable proportional band the amplification of the a.c. amplifier is varied by feeding back the output of the amplifier through an adjustable proportioning network which



LEVEL CONTROL STATION showing control valve, relay, and level unit. Note enlarged view of transmitter in illustration at right.

TRANSMITTER on level unit showing adjustment for specific gravity, and differential transformer.

INSTRUMENT MAN and operator check flow recorder.



REMOTE FLOW INDICATOR showing one with cover plate removed at flow control valve.

can be varied from 3 per cent to 200 per cent of the band.

The output of the a.c. amplifier goes to a phase-sensitive rectifier whose output is a d.c. voltage that is proportional to the difference between the signal voltage input and the set-point voltage input. This output may be zero (if the a.c. output is zero), positive, or negative with respect to ground.

For rate action, the output of the d.c. amplifier is fed back to the input through a rate network which delays the feedback. This causes a change in the input to be highly amplified by the normally high gain amplifier until the time delay is no longer effective and the amplification is reduced to a factor of one.

The output of the d.c. amplifier therefore varies in proportion to both the magnitude and the rate of change of the primary signal input to the set-point signal.

Reset action . . . The d.c. voltage and power amplifiers have an amplification factor of one and they provide the reset action of the controller and the power to operate the power relays.

When reset action is used, the amplifiers have maximum amplification under steady state conditions, but feedback decreases the amplification when the signal is varying.

The high amplification during steady-state conditions means that the controller resets to within 0.25 per cent of the proportional band.

In the event the controller fails, the control is switched to manual and the control valve is positioned with the manual controller.

An abnormal signal from the field energizes a flashing illuminated name plate and an audible alarm. The operator acknowledges the abnormal condition by pushing a button which silences the horn but maintains a steady light on the nameplate. On return to normal operation, the illuminated nameplate is deenergized.

The manual controller incorporates a very desirable feature which is an indicator that, when the control system is on automatic, provides an indication of control output in per cent of full output. When on manual control, the indication is of the output of the manual control.

Manual controllers allow the system to be balanced before transfer so the process isn't upset when changing from one type of control to the other.

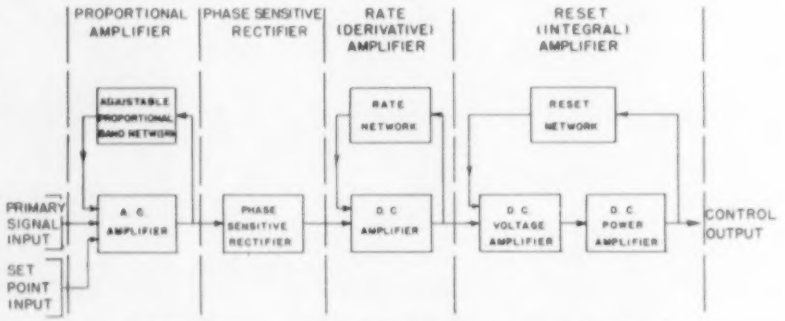
Liquid-Level Control

Liquid level is controlled electronically for the first time on these units. The primary signal transmitter is an external-cage-type Level-trol which has a conventional body, float, and torque-tube assembly, with a pilot (transmitter) which contains a differential transformer whose core is mechanically connected to the floats.

These connecting linkages may be adjusted to compensate for specific gravity and for span. The position of the core is adjusted to zero the instrument. The output of this transformer is then a primary signal of zero to 0.5 volt to the controller and recorder.

Sixteen level instruments are used in the following capacities: Five column bottoms level controls, four column midsection tub level controls, five receiver level controls, and two separator water-drawoff controls.

The mounting connections to the float chamber should be either the upper-side-and-bottom type or the top-and-bottom type. The reasons for this are that if the connections are of another type the float rests on the bottom of the float chamber when the instru-



ELECTRONIC COMPONENTS for Frontier's controllers. Fig. 2.

ment is set on zero (with the vessel dry) and will then read 3-5 per cent high when in operation.

Another problem is that any water which collects in the bottom of the float chamber may then freeze, holding the float or not permitting the float to operate at the lowest portion of its travel. If the top and bottom connections are used, then the nipples connecting the float chamber to the vessel can be lengthened or shortened as necessary to properly position the float chamber.

If on the other hand, the upper side and bottom connections are chosen, maintenance will be simplified. The flanged upper head of the float chamber is all that will need to be removed to make the internals accessible for maintenance. In any event, either arrangement will give the necessary flexibility for raising and lowering the float chamber without the undesirable effects of the closed bottom.

Electric transmission . . . Due to the speed and flexibility of electrical transmission, it is not necessary to locate the indicator or controller near the measuring element, but it can be placed in a location that is convenient for maintenance and is in a location where ambient conditions are most favorable to a long, accurate life.

This feature (speed of electrical transmissions) is noted especially when a change in the set point is made in that the level changes very rapidly to its new value which it seems to approach asymptotically.

Level instruments are used to drain water from the product separators by designing the float so that it will operate on the interface between the hydrocarbon and water in the conventional manner.

Test equipment has been designed that will permit the maintenance personnel to reproduce a primary signal for testing controllers and recorders at either the board or in the shop. The interchangeability of the units enables the repairman to take a defective unit to the shop where he can much more thoroughly test and repair the equipment. In the same way the transmitters can be maintained and tested either in the field or in the shop.

Plant Layout

The plant is laid out with the control room, pump house, compressor shelter, and gas treater on one side of a pipe rack, with the distillation columns, heaters, and reactors on the opposite side making for a very compact process area.

Primary measuring elements for flows, pressure, levels, etc., have remote indicators in the field at the control point. The advantages of this setup are obvious.

Field equipment is of explosionproof construction which is approved for Class I Group D hazardous locations. Class I Division 2 wiring is used throughout in that relays are sealed and other open contacts are sealed or enclosed in explosionproof housings.

To insure proper functioning in subzero weather, the relays have thermostatically controlled electric heating elements built in.

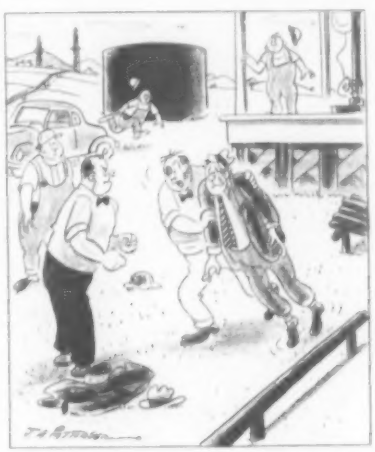
Signal transmitters . . . Primary signal transmitters are explosionproof with a pressure seal between the element and the conduit to prevent hydrocarbons from entering the conduit in the event of a seal failure. This is carried even further in case of the level transmitters which are explosionproof, with a pressure seal to prevent hydrocarbons from entering the conduit in the event of a break in the torque tube.

Conduit was used throughout to give the wiring system added flexibility for future revision or addition.

Power failures are handled by having a turbine-driven generator with an automatic relay which transfers the load from normal power to the generator. This system operates quickly enough to regain process control with no indication of upset other than the fact that on recorders the pen falls to the zero position then rises back up to the control point.

Maintenance of the system is carried out by one instrument man who was sent to a school of 1 week duration. This man has since passed on this information to the other personnel who indicate a decided favoritism to the electronic system compared to the conventional pneumatic systems.

To conclude, the electronic system has proved itself in action to operations personnel by swift, accurate control and to maintenance personnel by reliable service in both favorable and adverse conditions.



"This is my driller—he gets one-eighth of whatever I get."

Reference

"Swartwout Autronic Control Equipment," published by Swartwout Co.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained July 7, 1952 (page 105), as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

	Index (1946 = 100)					
	1949	1952	1953	1954	1955	Feb. 1956
Pumps, compressors, etc.	135.9	155.6	162.5	166.5	172.2	181.4
Electrical machinery	130.9	152.4	156.4	160.0	162.5	168.8
Internal-combustion engines	124.8	146.5	148.1	150.5	153.2	160.6
Instruments	123.1	146.2	151.8	154.6	162.9	180.3
Heat exchangers	133.0	165.8	174.9	171.7	156.8	188.0
Miscellaneous equipment average	*121.6	153.3	158.8	160.7	161.5	175.2
Materials component	143.6	164.3	172.4	174.6	176.1	186.2
Labor component	137.1	163.1	174.2	183.3	189.6	194.4
Nelson construction index	139.7	163.6	173.5	179.8	184.2	191.2

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

Seven Steps to Better Slides

1. Keep them simple. 2. Make them easy to read. 3. Strive for sharpness. 4. Use color if it helps. 5. Aim for brilliance. 6. Leave generous borders. 7. Stick to standard formats.

by Carl Hoot
District Editor

THE use of slide illustrations for technical meetings, company groups, or personnel indoctrination programs, is going great guns. But the quality of the average slide, hasn't gone anywhere. It remains about where it started.

First, you have a presentation job to do. Whether it be technical, or company public relations, don't dismiss the illustration part of it as "a problem for the draftsman."

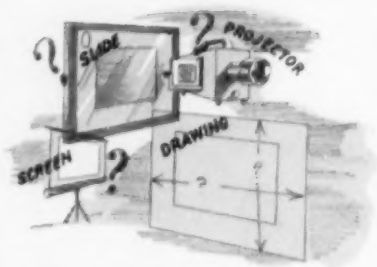
Here are a few simple steps that will insure you getting first-class slides. Try them and see if your art doesn't complement your paper, rather than dull it.

● Simplicity. Slides should have one main point. Reduce or eliminate grid lines, remove the legend if possible, and cut out unnecessary footnotes. Don't make the reader's eye wander over the screen.

● Easy reading. Use heavy lines, plain and bold lettering. If the viewer has to strain, he soon withdraws to rest his eyes. Or he may decide it's a good time to go for coffee.

You've got a captive audience, but their minds may walk out on you. To make your visual presentation equal the quality of your paper you have to consider layout, color, lettering, etc.

● Sharpness. Projection film or plates should be clean-cut, and fill the screen as nearly as possible. This has to start with the drawing, for no amount of photographic ability and equipment can undo a sloppy drawing. Tell the draftsman the purpose of your drawing. He needs to know the side of the slide you intend using, the format to use, and minimum letter size.



Ask about projectors that will be available where you are to give your talk, then tailor drawings and slides to fit. You may turn up with excellent viewgraph material (10 in. sq.), only to find you have to use a nice little 35-mm. projector.

● Color. Charts, graphs, and formation features make good presentation art. You can separate Zone "A" from Zone "B" clearly with color, and color attracts attention.

● Brilliance. This is most important. White tracing paper or other white drawing material that will take ink easily allows more contrast than blue tracing cloth. The latter places an entire blue field over the slide and reduces the projected light.

● Borders. Ask the draftsman to leave generous borders around the drawing. This allows the edges to "bleed" off on all sides of your slides. If this point isn't specified, you may find ragged edges showing on your slide when it's made with color film, and it's an added distraction.

● Format. This is the general layout of the drawing. When not sure, stick to the familiar 8 by 10 proportion. It fills most of the area of any size slide, and also the projection screen.

Give the eye a boost by showing it what to look for. A single point for a slide is the best rule.

Color and how to use it . . . When properly used, color is good, and color that is easy to apply is available in plastic products marketed as Zip-a-Tone, Artype, etc. You cut out the desired shape

Was this you at the last meeting? Your audience won't need opera glasses if you make sure your draftsman has used the largest lettering space will allow.

with knife point from adhesive-backed sheets, strip the backing, and burnish the color material to the drawing.

The same procedure goes for lettering, numbers, symbols, etc. It's fast and does a good job.

But stick to light shades, for readability and brilliance of your screen image depend upon how much light is transmitted **through** all this color.

What size slide? . . . Decide on this before turning your drawing ideas over to the drafting department. Size of the slide should be governed by its purpose, the size of your intended audience, and equipment that will be available for projection.

Good slides are not necessarily big slides. The trend is toward 2 by 2 in., due to advantages in equipment, cost, and portability.

For instance, anything larger than 2¼ in. square requires professional equipment not always available on a rental basis. Technical societies usually buy combination projectors which will handle all sizes, from 2 by 2 to the U. S. Standard lantern slide, measuring 3¼ by 4 in.

The lantern slide . . . Lantern slides have advantages when fine detail cannot be eliminated, or when showing to a large audience with the projector in the back of the room. Best practice with these slides, when using color, is the use of color film between glass sheets.

This size is easily focused, but slides must be handled individually. When specifying the lantern slide, make 16 by 20-in. drawing, with 1-in. minimum size letters.

The 2¼-in. . . . For technical meetings, luncheons, and where large screens are available, the 2¼ by 2¼-in. slide is very adaptable, and is a close running mate to the larger lantern slide. Cost is less, and projection equipment smaller and available on a rental basis.

It is especially efficient when material is on the square format, but does well with 8 by 10 proportions. Projectors run 300-500 watts, but rental machines are usually 1,000 watts. Brilliance is excellent with relatively short projection lenses.

Color film is recommended when colors are used, but glass plates may be used for black and white. Binding can be tape or metal slip—on mounts for easy replacement of broken glass. Slides must be handled individually when projecting.

Suggested drawing size is 16 by 20 in., with 1 in. minimum size letters.

The 35-mm. . . . For smaller groups, of 50 to 150 people, clear-cut 35-mm. slides have many advantages. This size is commonly called 2 by 2, and is made up of color film between glass when using color, or can be made up on glass plates for black and white only.

Cardboard mounts can be used in place of glass, reducing cost, weight, and breakage problems, but the film scratches easily and nearly every slide has to be brought into sharp focus.

Continuous film strips are also available in 35-mm., but they require special projection equipment and must be handled with care to avoid scratches.

More equipment for 35-mm. . . . No small part of the 2 by 2's popularity is due to the additional equipment available. Handling problems are simplified when using the automatic "magazine" type slide holders, which take either glass-bound or paper mounts. These magazines provide a permanent storage unit, from which they are shown without removing from the slide holder.

On top of the magazine is an index to the slides, by number, so the speaker may refer back to any slide in the file quickly and without confusion. A turn of a hand knob racks the device back and forth, and an indicator shows the number of the slide group into the projector. Slides are always right side up and ready for projection.

Projectors in this field may be had with electric slide changers, operated by remote control, or with fully automatic rotation, allowing a set time for each slide.

Projectors for 35-mm. are available on a rental basis wherever there are camera stores, and wattage runs 300, 500, and 1,000.

Conventional 35-mm. . . . Film size on this slide is 1 by 1½ in. and format proportion is 5 by 7. It presents a long and narrow field, and square drawings are at a disadvantage.

If the format fits your requirements, minimum drawing size is 10 by 14 in. Smallest letter size is ½ in.

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The Oil and Gas Journal

Full-frame 35-mm. . . . This is the latest addition to 2 by 2 equipment. It uses regular 35-mm. glass slides and projectors, but film area is increased to 1½ by 1½ in. Format returns to 8 by 10, and square or round drawings have a definite advantage in the added size.

Current projectors fully cover this new size slide with only a slight rounding of the corners, and combination projectors used by technical societies handle the full-frame slide with no limitations on corners. But it should be noted that some of the older 35-mm. projectors round off the corners, and a safe practice is not to extend lettering or other lines into the corners.

Minimum copy size is 11 by 14 in., and smallest lettering should be ½ in.

What about black and white negative film? . . . You can get good results from regular black and white film if you want to cut corners on cost, or need slides in a hurry. When made up using white background and **black lettering, the sequence is reversed on the film.** They make good projections and some opinion is that they are easier on the eye, but the black flim stops heat from the projector and slides should not be left on for any length of time.

BOOKS

ELECTRONIC DATAPROCESSING FOR BUSINESS AND INDUSTRY, by Richard G. Canning. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 332 pp., $7.

This book gives you the answers to three questions asked by top management executives: what is electronic dataprocessing, what can it do for company, and how should I go about investigating it. You need no previous knowledge of the electronics field in order to comprehend this book. The several major "patterns" of electronic data processing systems are clearly described and illustrated by references to actual case studies.

THE CANADIAN PETROCHEMICAL INDUSTRY. By the chemical division of Shell Oil Co. of Canada, Ltd. Published by Shell Oil Co. of Canada, Ltd., P. O. Box 400, Terminal A, Toronto 1, Ontario. 154 pp., distributed free to interested parties.

This book tells the story of the petrochemical industry in Canada from its birth some 15 years ago. The many aspects of this story and, in particular, the descriptions of manufacturing processes are covered in some detail.

Chapter 1 is devoted to synthetic rubber and particularly to the part that Polymer Corp., Ltd., played in the Canadian development of this material. Chapter 2 deals with glycols, polystyrene, and similar chemicals. Chapter 3 is devoted to carbon black and aromatic solvents.

Other topics covered are: Chapter 4, ammonia; Chapter 5, sulfur; Chapter 6, the use of petrochemicals in making cellulose acetate; Chapter 7, polyethylene; Chapter 8, isopropyl alcohol, acetone, and phenol; Chapter 9, glycols and polyethylene; and Chapter 10, formaldehyde and pentaerythritol.

Crude-Oil Measurement Is Going Automatic

Here is a progress report on some of the development and application of automatic measuring, sampling, and testing equipment to current crude-oil operations. The evidence shows that automatic measuring devices are being accepted in daily operations and can do a more accurate, efficient, and dependable job when properly applied, installed, and maintained than can be done by hand.

by M. H. Atkinson and A. H. Newberg

EACH day in the United States approximately 7 to 8 million barrels of crude oil and its products are handled by the oil industry in producing, transporting, manufacturing, and marketing operations. This total volume is measured and remeasured many times.

The sum of these transactions over a short time will generally equal the physical plant investment. Over any extended period it will greatly exceed the investment. Yet despite the monetary value, with risk of loss inherent in poor measurement practices, not enough attention is given to sound measurement procedures and facilities. The solution rests with giving proper attention and consideration to both the mechanical means and the human element involved in good measurement practices.

The Manual Method

Until a few years ago, hand or manual methods were used exclusively to make these important measurements: an etched steel hand line for level; a wood-back, cup-case, mercurial thermometer for temperature, and a stoppered bottle or thief for a sample. The sample was then tested for desired physical and chemical properties.

All of these measurements were made at the tank and assumed a liquid level accurate to within ⅛ in., and a temperature reading and sample that was representative of the tank contents. The only variation was the alternative manual line-sampling procedure. Testing was in accordance with proved laboratory and field testing procedures which for crude oil was limited to a hydrometer for gravity and centrifuging for b.s. and w.

Authors are with Service Pipe Line Co., Tulsa. Paper presented to the seventh annual spring pipeline conference and field trip, under the auspices of the A.P.I. Division of Transportation, Houston, May 14, 1956, under the original title, "Development and Application of Automatic Devices for Crude-Oil Measurement."

Automatic Devices

The measurement inaccuracies and shortcomings of the manual methods of making custody transfer or exchange speeded application of automatic devices. Emphasis upon the automatic devices was reflected in development and codification (approval for custody-transfer purposes) of positive-displacement meters, automatic samplers, automatic tank gages, and automatic temperature devices, in about that order. Positive-displacement meters are covered by the Joint A.S.M.E.-A.P.I. Code 1101. Automatic samplers were approved in both the older A.P.I. Code 25 and in the newer Standard 2500, and a new revision to this standard covering automatic samplers in greater detail is under consideration. Automatic tank-gage and temperature devices were included as revisions in the new issue of Standard 2500.

Other tests . . . Another group of interrelated devices also are being or have been developed and perfected for automatically obtaining properties such as gravity, b.s. and w., viscosity, Reid vapor pressure, flash point, product color, etc. The successful development of these instruments may eventually do away with the need for testing and hence sampling as it is commonly used today.

An associate development of automatic devices has been their accompanying remote transmission systems. It is possible to remotely transmit all of these instrument readings except those obtained by sampling and testing. Full utilization of this aspect of the use of automatic devices will be held up at least partly until testing results can be finally obtained and transmitted as straight instrument readings.

Remotely transmitted readings have code acceptance if mutually agreeable to the contracting parties. It is interesting to note that much of the impetus for enlarging and perfecting remote-transmission equipment came from the noncustody-transfer use of these and similar devices used in intracompany operations. It should also be noted that intracompany operation accounts for actually a greater use of these instruments than custody transfer, if automatic sampling is excluded.

It was inevitable that these components would be combined into a single system for automatic control of all the operations involved in making a custody transfer. This has taken place in the advent of automatic lease custody transfer. This system which will, with unattended operation, automatically tender oil from the producing field to a receiving pipeline is receiving serious consideration and experimental and trial installations have already been made. If these are successful, this type of controlled transfer will be accepted and standardized.

Future Trends

Probably, near-future trends in measurement practices can be reasonably predicted on the basis of the tools immediately available. It is possible right now by a combination of existing instruments, automatic controls, and remote transmission systems to remotely control and record at any one or a number of points the whole sequence of custody-transfer measurement.

A print-out system of this nature would record automatically the date, tank number, location, gross barrels, temperature, gravity, b.s. and w. content; reduce to net barrels and print out on multicopy teletype; adding machine tape, punch tape, or magnetic tape remotely at a central office and wherever else was desired along the way. Only two assumptions are made: that b.s. and w. content and gravity could be obtained with presently developed capacitance-type instruments and gravitometers. If remote control and recording can be made at the receiving end, it can feasibly be turned around and made to work at the delivery point or for that matter at any of the exchange or transfer points in between.

Positive-displacement meters . . . Meters have been used widely in products service and not nearly so widely for crude oil. The products people were forced to their use, and having to live with them they learned to make them work. They operate satisfactorily because their installations are carefully designed and they are properly in-

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stalled, operated, proved, and maintained.

The crude-oil industry on the other hand probably got off to a bad start in their use. There was always an acceptable alternative in the hand gaging of a not too highly volatile product that could be readily read on a steel tape.

Meters of all sizes have been improved in recent years by the use of better materials, bearings, and revisions in measuring element design. These permit higher capacities with less turbulence and wear from entrained foreign materials that no longer tend to lodge in streamlined chambers. Some of the most notable advances have been in read-out and control systems. It is now possible to get an infinite variety of readings and print-out locally and remotely with automatic control from multiple meter batteries, combining or subtracting as desired. These systems are being used successfully principally at product terminal facilities.

By all means use meters if they fit into your measurement problem. Their accuracy and dependability have been proved by years of service. But if you do use them, accept the responsibility of carefully designing the installation and properly operating, proving, and maintaining them after they are installed. Failure to do so will only result in a poor installation with unsatisfactory measurement results.

Automatic sampling devices . . . Automatic sampling of crude oil has been used for years for custody-transfer purposes. It has been estimated that as high as 40 to 50 per cent of all crude-oil custody transfers and exchanges are made by automatic samplers. They have been used more extensively than any of the other automatic devices for strictly custody-transfer purposes.

Actually, automatic sampling of crude oil has been extremely difficult by the nature of crude oil and the effects of lowering line and atmospheric temperatures on its components. The problem resolves itself into two phases. The first phase had to do with making straight constant-rate-type samplers that would work with different kinds of crude under varying conditions of temperature and, in some cases, pressure. Also operating personnel must be trained to maintain them.

The second phase is concerned more with the factors involved in obtaining a truly representative sample than in workable samplers since this problem has been at least partly solved. Manufacturers are now producing samplers which will work successfully in crude-oil service. Most of these are constant rate, and attention is now focusing on proportional-rate samplers.

Crude oil is nonhomogeneous and contains varying amounts of b.s. and w. which are not distributed uniformly through the moving stream. The industry is attempting to determine the minimum velocities and turbulence necessary for uniform mixing, the proper type and location of sampling tap, and whether a portion of the stream must be externally circulated or bypassed by or through the sampling device.

Another factor is how much the flow rate can change before a flow-responsive-type sampler is required. Answers will be found to these problems, but their lack should not discourage the use of automatic samplers because the results obtained are more representative than can be secured by manual methods.

Automatic tank-gages . . . Both direct and remote-reading automatic tank gages of known accuracy are acceptable for custody transfer. Up to the present time they have not had wide industry acceptance for strictly custody-transfer purposes for several reasons.

Principal reason is that maintenance costs are greater than those for manual gaging. In the absence of automatic temperature devices and samplers which would keep men off tanks, they might as well take a hand gage at the same time. This is particularly true of large tankage at terminal and delivery facilities where there is usually available manpower.

On the other hand labor costs are a critical factor on smaller field gathering and lease tanks because of dispersal and more rapid tank turnover. Here the trend is towards semi and full-automatic operation and automatic tank gages are being used. They also have an exclusive field in either area of application where highly volatile or dangerous liquids have to be handled.

There have been marked improvements in both the basic mechanical gage and particularly in the remote transmitting components since their inclusion in A.P.I. Standard 2500. The most notable improvement in the mechanical gage has been in the counterweight mechanism. The older weight type has been replaced with the better constant-tension coiled spring or Negator motor. With this has gone other improvements in reading facilities, tapes, pulleys, and float or sensing mechanisms. These improvements are reflected in better gage performance and reliability. The remote transmitting systems now include revisions in design which permit feasible long-distance as well as local transmission.

Automatic Temperature Devices

A variety of automatic temperature devices are permissible for custody transfer. Their accuracy and dependability have not been seriously questioned, but their use has been restricted by limitations in measuring means as to areas of application and specific need. They are needed and are used on the smaller, fixed-roof, lease and field gathering tanks where the trend is towards semi and full-automatic operation. For these installations the types other than electric resistance are used. On the larger tanks, other types could also be used on fixed roofs, although not conveniently due to tank height.

On floating roofs only the averaging resistance type can be used. These installations are expensive and probably cannot be justified except where the manual method is not thought to be representative, or large vapor losses and product downgrading result. These services would be with low-gravity, heated, and blending stocks, highly volatile or poisonous gas from produced liquids such as sour crudes. Certainly the need exists for a simpler, less expensive type of automatic temperature device, particularly for large-capacity tanks.

Capacitance measuring instruments . . . These instruments at their present stage of development offer at least the possibility of an automatic device for the determination of b.s. and w. and maybe gravity. Associated with them are other instruments also for measuring gravity and viscosity, Reid vapor pressure, and other properties.

If an instrument or instruments could be perfected for acceptable determination of b.s. and w. and gravity, they would remove the need for most sampling and testing in crude-oil measurement. B.s. and w. is the critical measurement; once this is solved, the others will follow as a matter of course. Acceptance of these determinations by methods other than sampling and testing involves much more than perfecting the instruments themselves. It could upset the whole industry's method of inventory and control. An increasing number of this class of instruments is being installed, tried, and used.

Conclusion

In conclusion we hope that the comparison and analysis which have been made of automatic devices and manual methods for crude-oil measurement will provoke thought towards continuing improvement of measurement practices. Measurement should not be considered just a "necessary evil" part of the business of buying and selling oil. Management should, in many cases, be more measurement and loss-control conscious. Effective control can be obtained if: first, the problems are understood, and, second, proper application is made of method and means.

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by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Viscosity Indexes of Typical Oils

What are the viscosity indexes of various raw lubricating oil stocks? We find higher indexes than those shown in Fig. 8 in Petroleum Refinery Engineering.—S.W.G.

The viscosity index of raw lubricating-oil stocks is higher than that of dewaxed oils because paraffin wax has a very high viscosity index. Dale Tull's master's thesis (University of Tulsa, 1953) indicates a v.i. of 200 for paraffin wax and a characterization of about 12.88. Thus, both the characterization factor and viscosity index may decrease sharply as a raw stock is dewaxed. One stock was encountered in which the characterization factor dropped from 12.44 to 11.44 as the wax (55.6 per cent) was removed.

Accordingly, the viscosity index of lubricating-oil stocks should be related to characterization factor in a way which introduces the amount of wax somewhat as in Fig. 1 herein, or in the figure shown in the Questions on Technology of March 24, 1954, page 131, "Effect of Dewaxing on Viscosity Index."

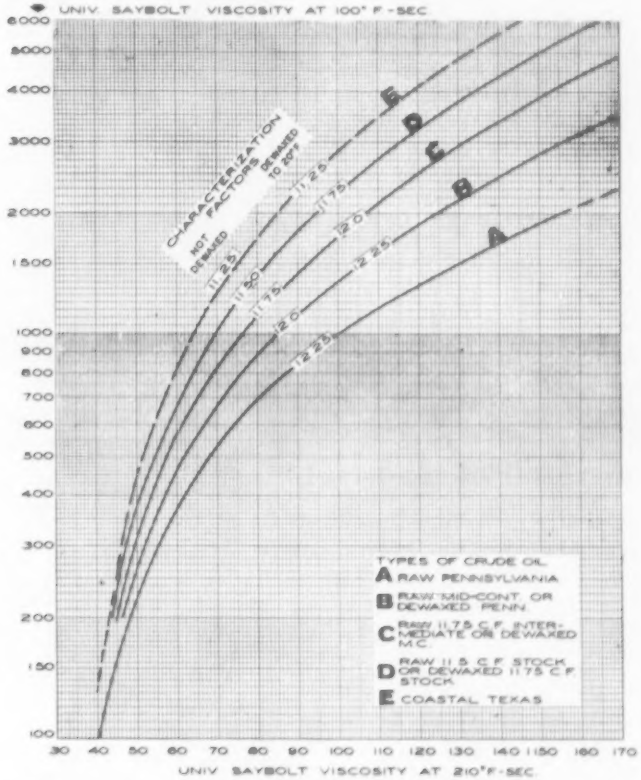

Fig. 1—Relationship of viscosity at 100° F. to viscosity at 210° F. for lube stocks from typical crude oils.

Fouling of Fin-Tube Exchangers

Are finned exchanger tubes fouled more than plain tubes? Doesn't dirt accumulate between the fins?—R.R.P.

Although flow conditions can possibly be encountered in which finned tubes will be fouled more than plain tubes, such scant information as is available indicates that finned tubes do not foul more than plain tubes. Photographs of material flowing transversely past fins (Knudsen and Katz, Heat Transfer and Pressure Drop in Annuli, Chem. Eng. Progress, October 1950, page 490) indicate that a rotating motion is set up in the fluid situated between the fins, and under most flow conditions the space between the fins is repeatedly swept out and replaced with fresh material. The turbulence appears to be possibly more violent under most conditions than at the surface of plain tubes.

The only direct comparison is that of Katz et al. (Fouling Rates for Fuel Oil Heat Exchangers with Plain and Finned Tube Bundles, Project M 592, Wolverine Tube Division, Engineering Inst., Univ. of Mich., July 1953). No. 5 fuel oil was circulated for periods up to nearly 700 hours. The finned tube bundle transferred about 62 per cent more heat than the plain tube bundle at all stages of the 700-hour run. The fouling factors built up to about 4 (finned) and 5 (plain) during the test. Numerous other tests were conducted to explore the effect of cleaning, flow rate, etc., and it appeared that the degree of fouling was similar for finned and for plain tubes.

Highest-Boiling Lube Oils Cause Engine Deposits

Are neutral oils or residual lubricating oils more satisfactory? I am thinking of the stability of the oils and the formation of deposits—S.F.G.

There is probably no specific answer to such a question. The highest-boiling-range oils such as bright stocks or lubricating oils made from long residua, probably suffer smaller losses in the engine than lower-boiling less viscous oils. However, the high-boiling oils also produce the largest amounts of engine deposits. This was pointed out long ago by Balke et al., S.A.E. Journal, 29, 215 (1931). More recently a good correlation between total engine deposits and the 95 per cent distillation temperature was obtained by Bartleson and Hughes (Ind. Eng. Chem., 45, 1501, July 1953). For the oils tested by their particular engine test, they found about:

Engler 95 per cent point, °F.	Grams, total engine deposit
850	12.5
900	18.5
950	24.0
1,000	30.0
1,050	36.0

Neutral oils are usually considered as materials that boil to about 900° F., although most coastal bright stocks also have a low-boiling range. The Engler temperatures were obtained by A.S.T.M. Method D-1160-51T.

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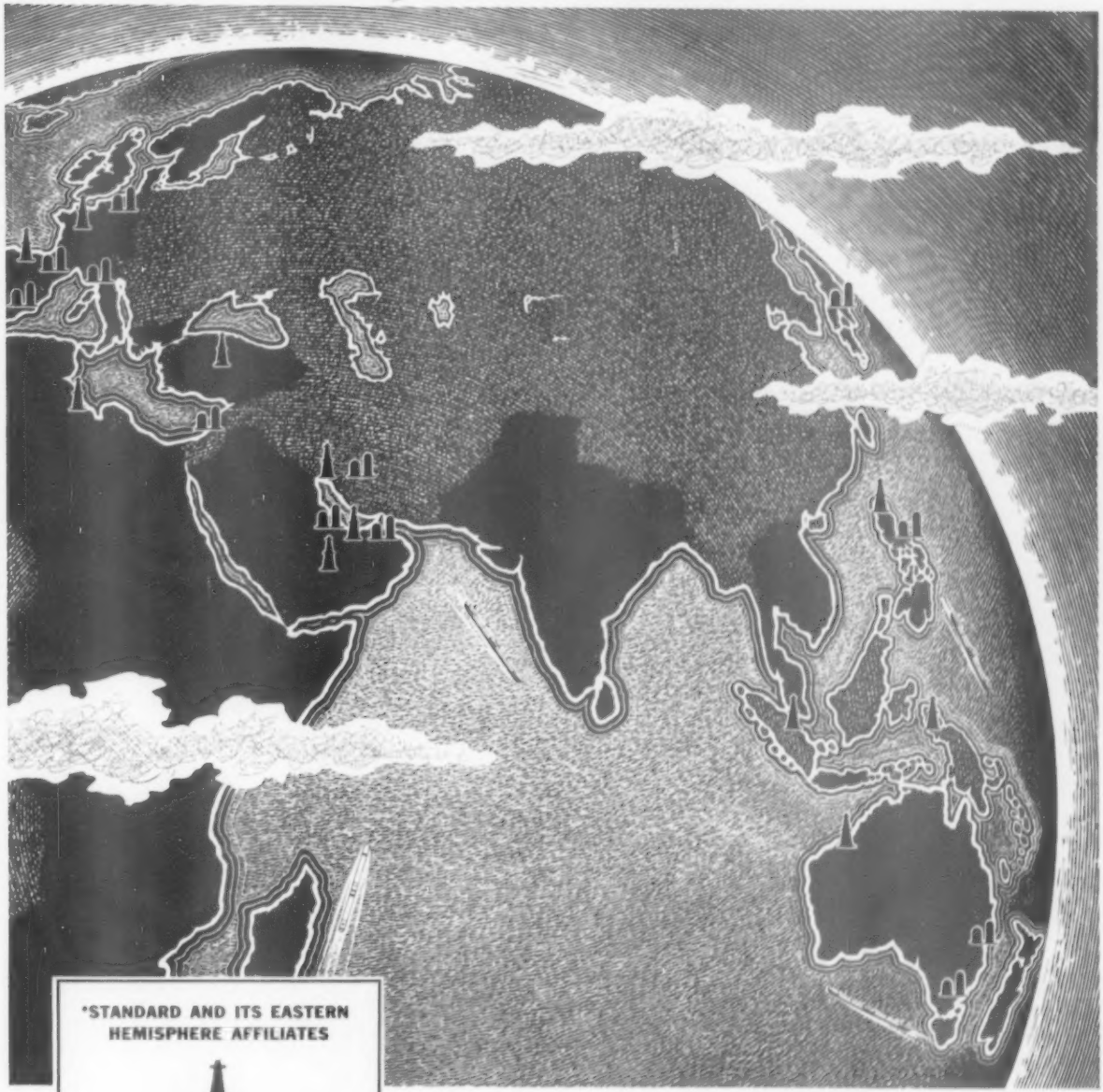

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JOB IMPROVEMENT FOR THE PROCESS FOREMAN—54

The A, B, C's of Instrumentation—7

THE earliest controller, and the one still used when an instrument fails to function, is the human hand. Even this has been supplemented by a remote manual control to be used when the controller alone fails.

Pressure is sometimes controlled by a spring-loaded diaphragm valve (Fig. 40), in which the pressure to be controlled is applied directly to the diaphragm. This type of valve is good for small air supplies and the like, but it is not flexible enough to meet the changing requirements of process pressures.

A similar valve (Fig. 41) is sometimes used for temperature control by having a temperature-sensitive-bulb system attached to a bellows which actuates the valve in place of a diaphragm. Again, this arrangement is not flexible enough for general use. Pneumatic types of controls are more generally accepted for refinery use. The nonrelay pilot type (Figs. 42 and 43) is used where simplicity is favored over close control.

The relay types are capable of giving close control with additional control function added to them to fit the control problem. Fig. 44 illustrates the relay type with "on-off" control. This is suitable for services requiring only that the valve be wide open or completely closed.

The job requires that the valve "throttle" or open only to the degree needed at the moment, then "throttling range" (sometimes known as "proportional band") must be added to the "on-off" type (Fig. 45). This would appear to take care of everything—but it doesn't. For instance, in controlling a given pressure, a small valve opening may normally be required. But then conditions may change to require a large valve opening for the same pressure. With throttling range alone, a new compromise pressure would be assumed in order to force the valve open. This results in the control point "lining out" at some new point on the chart. This condition requires "reset" action (or "droop correction") added to throttling range (Fig. 46).

Rare occasions, such as some furnace controls, require another control function to be added. This may take one or two forms, either "direct derivitive" (preact, Fig. 47), or "inverse derivitive." Direct derivitive gives the control a little quick shot in the direction it is about to go. Inverse derivitive delays the action momentarily to see if the control is going to recover of its own accord.

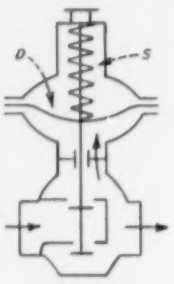

Fig. 40.

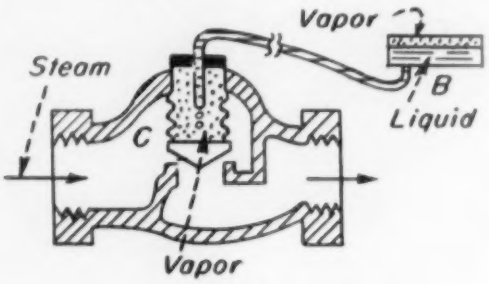

Fig. 41.

Fig. 42.

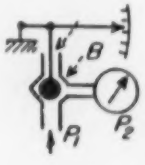

Fig. 43.

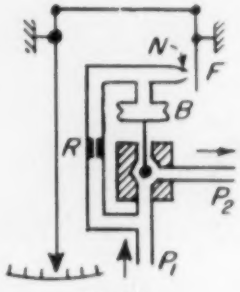

Fig. 44.

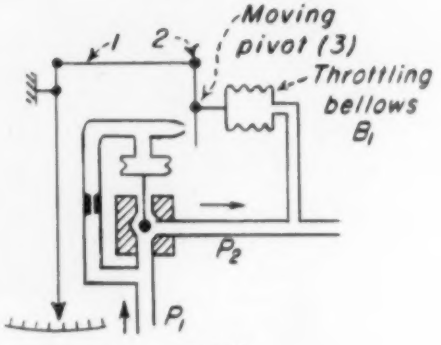

Fig. 45.

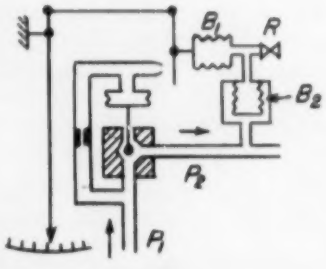

Fig. 46.

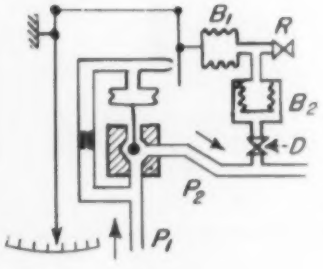

Fig. 47.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

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Industrial Power Cycles for Oil-Industry Use—2

by Stephen Bencze

INDUSTRIAL power cycles vary widely from the simplest to the most complex. The simplest cycle is one in which electric power is generated by a steam-turbine-driven generator and the exhaust steam goes to a condenser. No intermediate steam is bled from the turbine for feedwater heating.

Probably the most complex cycle is one in which, in addition to electric power, generation steam is extracted at controlled pressures at one or two points in the turbine. This steam is used for process or for auxiliary turbine-driven equipment and the exhaust from the turbine is used for additional process or building heating.

The various types of industrial cycles can be classified generally as follows: (1) simple condensing cycle; (2) simple noncondensing cycle; (3) condensing-extraction (either controlled or noncontrolled); and (4) noncondensing-extraction (either controlled or noncontrolled).

The particular type of cycle used in each case is determined by the many particular requirements of the industry. As a general principle, the capital investment and operating costs of a less-complicated cycle and less-expensive turbine may be balanced against savings anticipated with more elaborate equipment.

The steam turbine is the heart of any industrial power cycle. It determines the way in which the heat available in the cycle is put to use. It determines the amount of electrical or mechanical power and process steam that will be derived from the cycle.

Fig. 2 shows a tabulation of the various general types of turbines available, their usual operating conditions, and their general application.

Author is with DeLaval Steam Turbine Co.

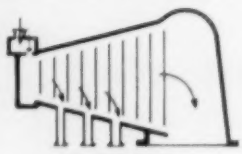
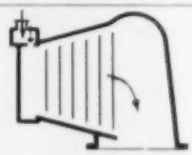
BASIC TYPE	OPERATING CONDITION	APPLICATION
 CONDENSING BLEEDER	High pressure (with or without extraction for feed heating)	Industrial power unit, AC or DC generators, blowers, compressors, water works pumps
 LOW-PRESSURE CONDENSING	Low pressure (Exhaust)	Combination with reciprocating engine, or low pressure steam supply; electric generators, blast furnace blowers,
NONCONDENSING, OR SUPERPOSED	Superposed "Topping" Moderate and low back pressure	Power stations, large industrial plants; increased output and improved station efficiency by superposed cycle exhausting into existing steam header. Small turbines for power plant auxiliaries, fans, exciters, blowers, generating sets, stand- by and quick-starting emergency units.

Fig. 2-A

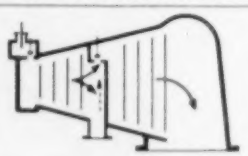
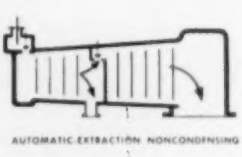
BASIC TYPE	OPERATING CONDITION	APPLICATION
AUTOMATIC-EXTRACTION CONDENSING	High pressure (with automatic extraction)	Industrial plants, by-product power, process steam, heating, drying, digesters.
 EXTRACTION-INDUCTION	Mixed pressure Induction or Extraction	Industrial plants, combination with process steam, waste heat boilers, steam accumulators.
 AUTOMATIC-EXTRACTION NONCONDENSING	Automatic extraction	Industrial plants requiring process steam; house turbines in electric power stations.

Fig. 2-B

by W. L. Nelson
Technical Editor

COST-imating

13. Costs of Furnace Details

THE tabulations on this page indicate the 1946 costs of various items used in furnace or pipe-still construction (Table 1) and indexes by which these costs can be converted to other years.[1] The approximate amount of steel needed for the structures of various types of stills[3] is indicated in Table 2. Related information on pipe stills was published in the No. 12 installment of this series (The Oil and Gas Journal, May 21, 1956, page 245).

References

1. Nelson, W. L., The Nelson Refinery Construction Cost Index, The Oil and Gas Journal, July 7, 1953, p. 105. (The Nelson Index appears in the first issue each month and in addition indexes for many items of equipment are published in the first issues of January, April, July, and October.)
2. Nelson, W. L., Furnace Details, The Oil and Gas Journal, April 14, 1949, p. 125.
3. Nelson, W. L., Structural Steel, Pipestills, Etc., The Oil and Gas Journal, July 28, 1949, p. 339.
4. Author's personal files.

COST INDEXES OF FURNACE EQUIPMENT (1946 — 100)[1,2]

	Brick					Refinery construction labor	Nelson Index
	Bldg.	Fire-clay	Forgings	Seamless tubes	Iron castings		
1946	100	100	100	100	100	100	100
1947	110	114	121	115	119	113	117
1948	123	133	130	135	145	128	132.5
1949	128	140	140	141	150	137	139.7
1950	132	153	151	150	153	144	146.2
1951	141	165	167	163	167	152	157.2
1952	141	167	179	169	168	163	163.6
1953	143	182	189	188	177	174	173.5
1954	145	193	196	199	181	183	179.8
1955	154	206	209	220	185	193	184.2

TABLE 2—APPROXIMATE WEIGHT OF PIPE-STILL FRAMES[3]

Millions B.t.u./hr.	Lightest	Intermediate	Heaviest*
20	46,000 Upflow circular	Overhead convection	100,000 Down convection
40	72,000 straight-up	Swedged upshot	160,000 Box type
60	90,000 A-frame	Circular	207,000 Center convection

*Maximum weights apply to suspended wall constructions.

TABLE 1—PIPE-STILL CONSTRUCTION ITEMS, 1946 COSTS

Material or item—	Unit	Costs, 1946 Material	Labor	M. & L.
Cast iron:				
General, header plates, etc.	ct. per lb.	9-15	3-4	12-18
Low-alloy iron castings	ct. per lb.	12-19	3-4	15-23
Explosion or inspection doors	each	50-70	15-20	67-85
Peep boxes	each	50-60	15-20	67-75
Tube supports, high temperature:				
16 per cent chromium	ct. per lb.	30-40	7	40-50
Chrome nickel	ct. per lb.	45-60	7	55-65
Burners:				
Oil, 5,000,000 B.t.u. per hour	$ each	100-170	30-40	135-200
Oil, 10,000,000 B.t.u. per hour	$ each	180-240	50-70	240-300
Oil	$ per M.M.-B.t.u.	19	7	26
Gas, 5,000,000 B.t.u. per hour	$ each	50-65	30-40	85-100
Gas, 10,000,000 B.t.u. per hour	$ each	85-120	50-70	140-180
Gas	$ per M.M.-B.t.u.	12.5	7	20
Combination	$ per M.M.-B.t.u.	26	8	34
Tube rollers, two sets with motor	$ each	530-600		
Tube rollers, only cutter set	$ per set	130-170		
Stack (insulation) lining	$ per sq. ft.	0.50	0.25	0.75
Steel:				
Structural	ct. per lb.	9-10	3-4	12-14
Stack (guyed in place)	ct. per lb.	14	3.5	17.5
Breeching or duct-work[a]	ct. per lb.	20-30	10-20	35-45
Grating for walkways	$ per sq. ft.	0.85-0.91	0.17-0.20	1.02-1.11
Stairway, complete	$ per ft.			18-45
Walkway with one rail, 48-in.	$ per ft.			6.60-12.60
Plate	ct. per lb.			11-14
Brick, common or red[b]	$ per M.	18-24	45-55	65-75
Brick, fire clay[b]	$ per M.	58-73	60-75	115-145
Brick, insulation[b]	$ per M.	130-158	60-75	190-220
Tile, suspended roof, 10-in.	$ per sq. ft.	2.90	2.30	5.20
Tile, arch, 8-in.	$ per sq. ft.	3.10	2.50	5.60
Cement board, ¼-in. flat	$ per sq. ft.	0.26	0.10	0.36
Cement board, ½-in. flat	$ per sq. ft.	0.50	0.17	0.67
Cement board, ¼-in. corrugated	$ per sq. ft.	0.27	0.10	0.37
Mortar or cement:				
High-temperature, for fire clay[c]	ct. per lb.	4.5-5.5		
Insulation[d]	ct. per lb.	5.0-6.5		
Wall wash for seal[e]	ct. per lb.	9	8.5	17.5
High-temperature castable refractory[f]	$ per ton	60-113		
Plastic firebrick or clay[g]	$ per ton	58-62		
Vermiculite[h]	ct. per lb.	1.5		
Insulation behind headers[i]	ct. per lb.	6		
Asbestos rope for joints[j]	ct. per lb.	36-39	8-9	44-48
¼-in. square	$ per 100 ft.	3.00		
½-in. square	$ per 100 ft.	8.00		

(a) Weight 10-15 lb. per sq. ft. (b) 18 brick per cu. ft., laid up. (c) 400-500 lb. for 1,000 fire brick. (d) About 75 lb. for 1,000 brick. (e) About 250 lb. for 1,000 sq. ft. wall area. (f) Density 55-75 lb. per cu. ft. (g) Density about 75-90 lb. per cu. ft. (h) Density 25 lb. per cu. ft. (i) 4-5 lb. per sq. ft. header area. (j) About 30 lb. per million B.t.u.

PORTABLE-GASOLINE-PLANT SYMPOSIUM

Designing a Midget Plant for West Texas—1

by F. H. Lacy, Jr., and G. B. Evans

ROPES field, Hockley County, Texas, was discovered in May 1950. Sixteen wells were in production in early 1953. Production is from the Canyon Reef formation at about 9,300 ft. Information available at the time indicated that the reservoir was performing under the influence of a strong water drive. P.V.T. data showed that the bubble-point pressure of the reservoir fluid was too low for the wells to go on the pump.

It appeared likely that if a secondary-recovery operation were undertaken in the field, (1) it would begin before the reservoir pressure dropped to bubble-point pressure, and (2) it would be a water-injection project. Therefore, we believe that the pressure in the reservoir could be maintained at or above bubble-point pressure either by natural water drive alone or by natural water drive supplemented by water injection.

Thus it was apparent that during the life of the field, little if any change in the composition of the produced gas could be expected. The produced gas in the Ropes field, incidentally, is a relatively rich gas. Its approximate composition is shown in Table 1.

TABLE 1—ROPES FIELD WET-GAS COMPOSITION

	Mole per cent
N_2	7.04
C_1	40.22
C_2	13.98
C_3	20.60
$i\text{-}C_4$	3.08
$n\text{-}C_4$	8.14
$i\text{-}C_5+$	6.94
	100.00

Production in Ropes field is owned by Honolulu Oil Corp. and Signal Oil & Gas Co. These two companies, after considering the foregoing, decided that it was feasible to design and construct a plant which economically would conserve and process Ropes gas. The volume of gas available for processing was slightly less than 2,000 M.c.f.d. This small quantity of gas, even though relatively rich, made it imperative that both capital and operating costs be kept to an absolute minimum. Nevertheless, the expected long field life (more than 20 years) required that only the best materials and equipment be used.

To meet pipeline-residue-gas specifications, the residue gas had to be substantially dehydrated and at least 65 per cent of the propane in the wet gas—and practically all of the heavier hydrocarbons—had to be recovered because there was no rail facility in the immediate area and no pipeline outlet for any of the plant products, the plant had to be designed to recover, fractionate, and load plant products which could be utilized in the truck-transport market.

To keep both operating and maintenance expenses to a minimum and to keep capital costs as low as possible, processing techniques were required which would:

1. Eliminate the use of electricity for everything except such noncritical, intermittent uses as plant-lighting, product-loading, and starting the air compressor.
2. Eliminate boilers or vaporizers, steam or otherwise, operating at a pressure greater than 15 psig.
3. Reduce the necessity of water-treating to a minimum.
4. Utilize the expansion of fuel gas to drive all pumps not driven directly from the compressor engine.
5. Provide for high liquid-product recovery at all loads and fractionate the product so recovered into 95 per cent purity propane, 80 to 125-lb. R.v.p. L.P.G. mix, and 12 to 26-lb. R.v.p. gasoline.
6. Provide for delivery of dehydrated residue gas at 500 lb.
7. Provide substantially automatic operation, with personnel required only for the essential duties of plant maintenance, plant office, product testing, and product loading.
8. Provide for stable, reliable, and inherently safe operation with a high-service-factor plant.

OVER-ALL VIEW of the plant, showing paracymen vaporizer, overhead piping, process area, and compressor building.

Authors are with Honolulu Oil Corp. Paper presented at the thirty-fifth annual convention, N.G.A.A., Fort Worth, April 11-13, 1956.

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	St. Louis	San Francisco	Seattle	Waterbury	

Contamination Index—3

Evaluating the Contamination Index

by J. J. Watt, B. G. Martin, and W. H. Still

THE procedure for determining the Contamination Index was given in the last installment (May 21, 1956, page 239). Several contamination correlations, Figs. 1 through 4 in the last installment, are necessary because it is pertinent to know the volatility of the gasoline.

Leaded gasoline vapors will form lead deposits on the detecting element of the meter. To remove these deposits, aspire vapors of unleaded gasoline or alcohol through the indicator. Always clear the indicator by purging with fresh air after each test.

The Laboratory Study

The laboratory evaluation of this method was made and the necessary data was collected for the preparation of correlation charts between Contamination Index and Tag Closed Tester flash results as follows:

1. Blends were prepared using distillate burning oils of different flash-point levels and gasolines of different vapor-pressure levels. Each oil was blended with ¼, ½, 1, and 1½ per cent by volume of the gasolines.

2. Contamination Index readings were taken on all samples under controlled temperature conditions at 30°, 50°, and 77° F. The Tag C.T. flash point was also obtained on each sample.

3. The type instrument used in the laboratory study was a Model W-11, MSA Combustible Gas Indicator calibrated with n-pentane. Frequent and periodic checks on the accuracy of the meter were made.

Preliminary tests indicated that similar quantities of contaminating gasolines of different A.S.T.M. Reid vapor pressures produced different flash results and Contamination Indices. Further data collected indicated that the more volatile portions of the gasolines were influenced by the temperature of the sample (see Table 1). The higher the temperature, the higher the readings. The findings are in logical and theoretical order. The MSA Explosimeters, Model 2, have been successfully used in the field.

Examination of the data obtained in the laboratory study revealed the following:

1. Different contaminating gasolines in identical proportions in the same distillate burning oil gave different Contamination Indices. These variations in results were traced to differences in composition in the gasolines. Thus, the more volatile portions (C_3, C_4, and C_5 content) of gasoline produced not only different Contamination Index results but also different Tag C.T. flash points (see Table 1).

2. For a given blend, the temperature of the sample markedly affected the relationship of Contamination Index readings and flash point and/or the percentage contamination. The higher the sample temperature, the higher the readings for the same blend (see Table 1).

3. The same quantity of a given contaminant gave essentially the same Contamination Index readings regardless of the flash point of the burning oil (see Table 2).

4. The Contamination Index, when correlated with sample temperature and volatility of the contaminant, gave reliable indications as to the amount of contamination.

5. It was found that the A.S.T.M. Reid vapor pressure test could be used as a reasonable reference to measure the difference in the volatility of the contaminating gasolines.

Authors are with Atlantic Refining Co., Philadelphia.

TABLE 1—EFFECT OF THE COMPOSITION OF THE CONTAMINANT AND THE TEMPERATURE OF THE SAMPLE ON THE CONTAMINATION INDEX

Contamination 1 Per Cent by Volume in All Samples

Sample—	Temp. (°F.)	Contaminant: Summer gaso. C.I.	Contaminant: Summer gaso. Tag C.T. flash	Contaminant: Winter gaso. C.I.	Contaminant: Winter gaso. Tag C.T. flash
130° F. flash-point distillate burning oil	40	28.0	104	38.0	100
	50	32.0	103	45.5	100
	60	37.0	103	54.0	99
150° F. flash-point distillate burning oil	40	28.0	116	38.0	106
	50	32.0	115	45.5	105
	60	37.0	115	54.0	105

C.I.—Contaminant Index.

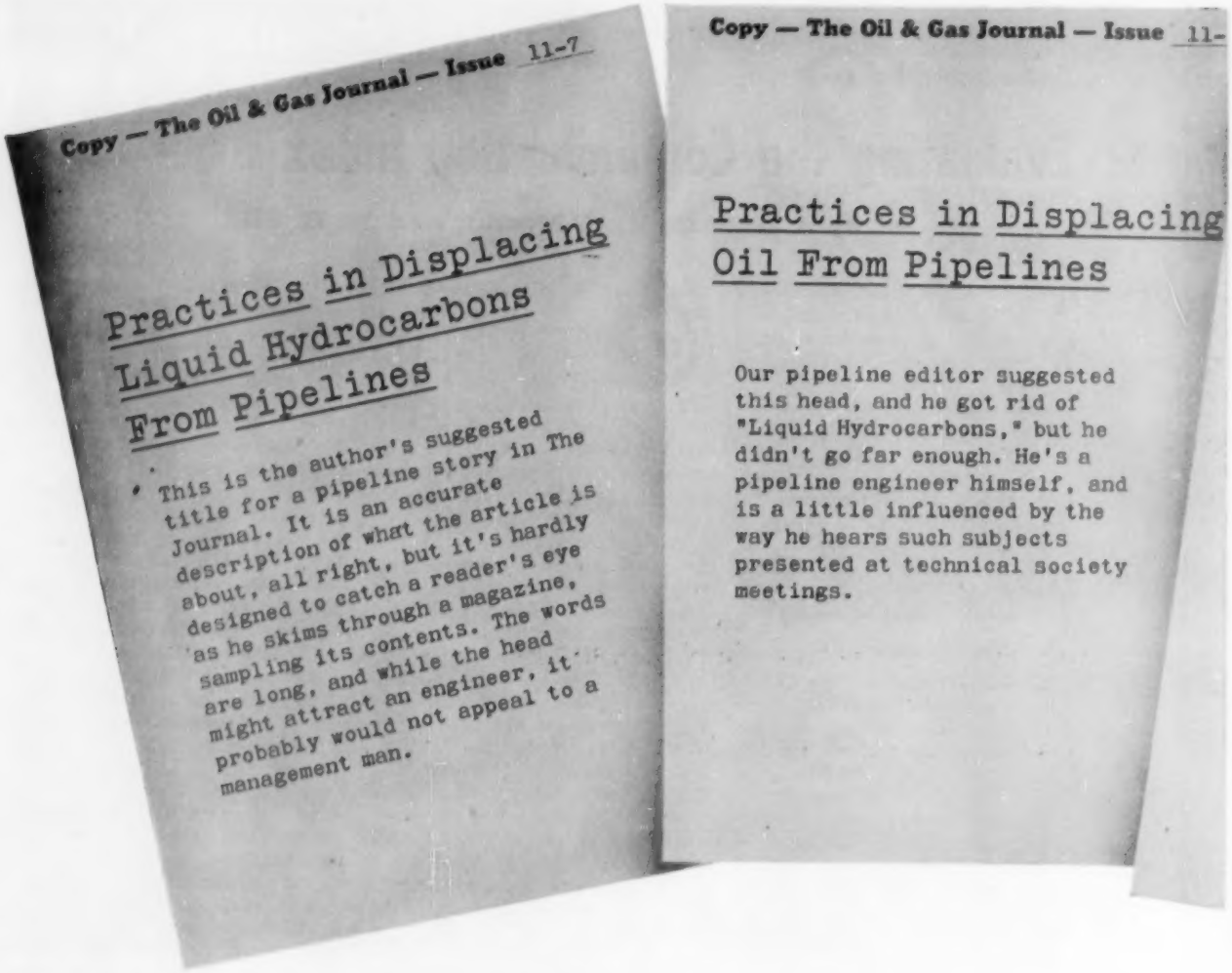
Summary of Analysis Commuted From Mass Spectra

Composition of contaminant—	Contaminant: Summer gasoline	Contaminant: Winter gasoline
Propane	0.12	0.71
Butane	5.00	8.80
Pentane	17.00	15.00
Hexane and higher	77.88	75.49
Total per cent	100.00	100.00
R.v.p., lb.	9.0	12.0

TABLE 2—TYPICAL DATA SHOWING THE EFFECT OF THE FLASH LEVEL OF THE BASE OIL ON CONTAMINATION INDEX AND FLASH DEPRESSION

Per cent by vol. of contaminant—		Summer gasoline: 0%		¼%		½%		1%		1½%		Winter gasoline: 0%		¼%		½%		1%		1½%	
Base oils—	°F. flash	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.	C.I.	F.D.
Distillate burning oil	138	6		11	7°	16	16°	28	20°	38	40°	7		15	12°	26	20°	43	36°	60	50°
Diesel fuel	162	6		11	12°	16	24°	28	46°	39	62°	7		16	16°	26	30°	44	52°	61	72°
300° burning oil	272	6		12	60°	16	97°	28	142°	39	165°	7		16	82°	26	102°	46	152°	63	174°
150 in at 100° solvent oil	405	6		11	160°	18	210°	30	265°	42	295°	7		16	162°	26	220°	48	272°	76	305°

All samples at 50° F. C.I.—Contamination Index. F.D.—Flash depression.


Copy — The Oil & Gas Journal — Issue 11-7
Practices in Displacing Liquid Hydrocarbons From Pipelines
This is the author's suggested title for a pipeline story in The Journal. It is an accurate description of what the article is about, all right, but it's hardly designed to catch a reader's eye as he skims through a magazine, sampling its contents. The words are long, and while the head might attract an engineer, it probably would not appeal to a management man.
Copy — The Oil & Gas Journal — Issue 11-
Practices in Displacing Oil From Pipelines
Our pipeline editor suggested this head, and he got rid of "Liquid Hydrocarbons," but he didn't go far enough. He's a pipeline engineer himself, and is a little influenced by the way he hears such subjects presented at technical society meetings.

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Copy — The Oil & Gas Journal — Issue 11-7

Here's How to Remove Oil From Your Pipeline

It was also suggested to run this title, which was better, but, after all, more than crude oil must come out of the pipeline so that the line can be repaired or cleaned, or the pipe salvaged. "To remove oil" just doesn't convey the idea of making sure the line is completely empty before working on it.

Copy — The Oil & Gas Journal — Issue 11-7

How to Empty a Pipeline

It's a risky job, and the industry hasn't all the answers yet

As The Journal printed it, the headline has that exciting how-to angle, which assures attention. It is short; all of the words are short, and easy to understand. And the idea gets into the reader's mind quickly. The deck amplifies the main title — and prevents over-selling by pointing out that all of the problems about emptying pipelines are not solved yet.

THE OIL AND GAS JOURNAL
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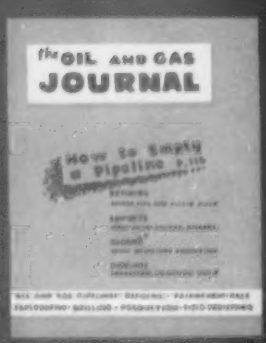

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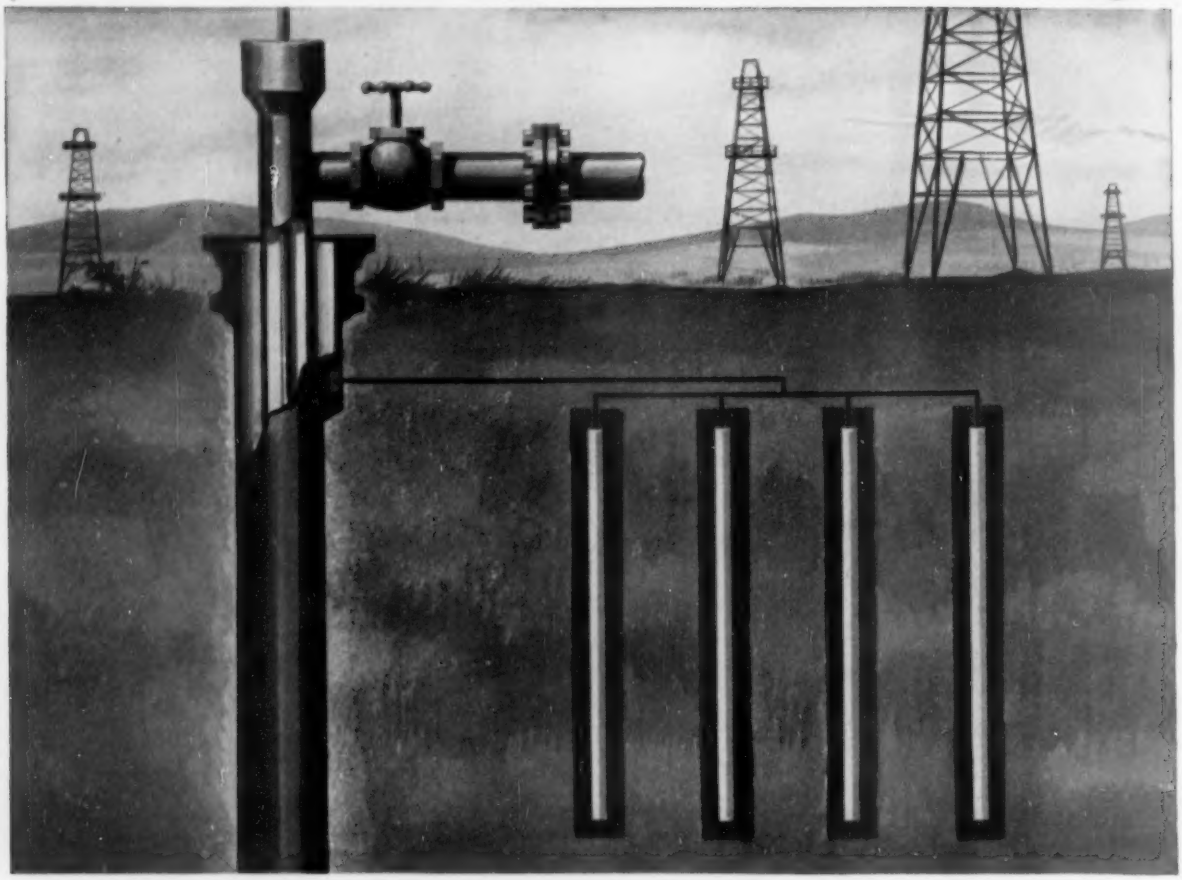

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GALVOMAG anode boosts current output

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Here's a resume of the unusual problems encountered in building . . .

NATO's new 4,500-mile pipeline system

by J. R. Shipley

A 4,500-MILE pipeline system to supply fuels to airfields and motor vehicles was authorized and is now being built by NATO. New organizations in almost all NATO countries were required to handle the projects.

There were many difficulties resulting from differences in bidding regulations among various countries, inadequate equipment and techniques of most contractors, lack of laws and regulations governing pipelines, and national-boundary crossings. The major problem facing NATO is organizing, manning, and training a competent operating organization.

Development by NATO

The North Atlantic Treaty was signed by 12 countries on April 4, 1949. Greece and Turkey became members in February 1952, and in 1955 the Federal Republic of Western Germany became a member. The present 15-member governments are Belgium, Canada, Denmark, France, Western Germany, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, the United Kingdom, and the United States.

After the treaty became effecive, it soon became apparent that the military forces for mutual defense should be under one commander. This led to the appointment of a supreme commander in December 1950. It was followed by the formation of an international military staff known as SHAPE (Supreme Headquarters, Allied Powers, Europe), which is now housed in temporary buildings near Versailles.

To implement the policies established by the treaty, a council and several committees were formed with the overall alphabetical name of NATO (North Atlantic Treaty Organization).

As the complexities of carrying out the objectives grew, it became necessary to establish a permanent international secretariat, which was organized in 1951. Its status was set by an agreement signed at a Council meeting in Ottawa, Canada, in September 1951. This secretariat is now housed in temporary buildings at the Palais de Chaillot in Paris.

NATO International Staff POL Section

The decision to construct a pipeline system created a need for a new staff section at NATO staff headquarters. This section was formed and named the POL Section. The name is derived from that given by the United Kingdom to petroleum branches. It means the Petrol, Oils, and Lubricant Section, but its function in NATO is to handle only pipelines and terminals.

The first head of the section was G. P. Jennings, Phillips Pipe Line Co., Bartlesville, Okla. The writer succeeded Jennings in September 1954, and was replaced in December 1955 by R. A. Troseth of Texas-New Mexico Pipe Line Co., Midland.

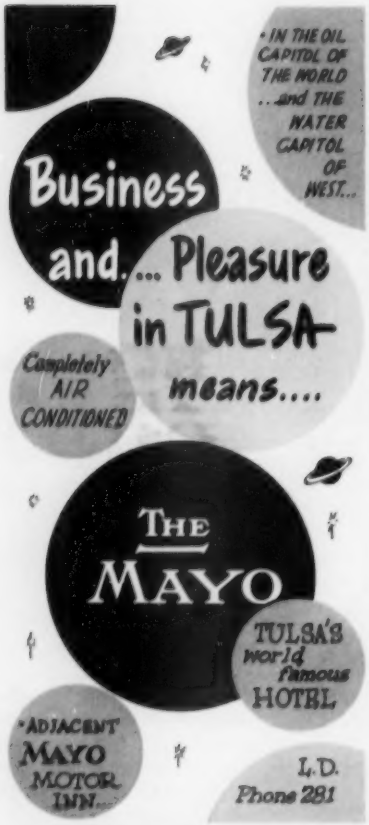
The contemplated construction of product pipelines in Europe created an immediate organization and manning problem. With the exception of a short product system in France which has been built since 1951, construction of a military system during World War II in the United Kingdom, and construction of several gas lines, there had been no pipeline construction in Europe. Consequently, there were practically no personnel in Europe experienced in design, construction, or operation.

In practically all countries, it was necessary to create a new organization to handle the projects. The plan used varied in the member countries. In some countries, separate bureaus were created to handle all problems and were manned by recruits from oil companies in those countries. In other countries, separate small bureaus for control were formed, with the actual design and supervision of construction contracted to consulting engineering firms (called architect-engineers or A.E.'s for short in Europe). Practically all of the bureaus were attached to military departments.

These organization plans still left a problem of obtaining experienced personnel. In general, they were unavailable in sufficient number. Consequently, there was a long delay in starting the actual program while the necessary pipeline construction, and documents on testing of lines, cutting of batches,

SPEAKERS AND PRESIDING OFFICERS for the A.P.I.'s annual pipeline conference are, left to right, J. R. Shipley, Sohio Pipe Line Co.; G. P. Jennings, Phillips Pipe Line Co.; M. H. Atkinson, Service Pipe Line Co.; Milton Ludwig, Standard Oil Co. of California; D. L. Fayman, Great Lakes Pipe Line Co.; Clyde Aldridge, Magnolia Pipe Line Co.; J. W. DeGroot, Tuscarora Pipe Line Co., Ltd., (program committee chairman), and J. D. Harnett, Standard Oil Co. (Ohio).

The author is with Sohio Pipe Line Co., St. Louis. Paper presented to the seventh annual spring pipeline conference and field trip, under the auspices of the American Petroleum Institute's division of transportation, in the Shamrock Hotel, Houston, May 14, 1956.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corrosion protection, etc.

All of these documents and plans were approved and issued by the Infrastructure Committee. Also all host countries have been supplied with the A.P.I. Tentative Bulletin 1105: Bulletin on Construction Practices for Oil and Products Pipelines, and the A.P.I. Tentative Standard 1104: Standard for Field Welding of Pipelines. Many field trips were made by the members of the POL Section to host countries to help select cities and routes for lines and terminals and to advise in preparing the plans.

The pipeline construction recommended was of simple, straight-forward design using Grade B line pipe. The coating is one coat of enamel reinforced with either one coat of felt or fiberglas.

The pumping-station design adopted as standard consists of multistage centrifugal pumps driven through speed increasers by diesel engines and operating in series. The pumping units are designed for portability. The units are housed in blastproof reinforced-concrete buildings. The control system is of the primary type for protection of the line and major functions of the pumping unit. All of the designs were based on minimum capital cost to meet the military requirement without regard to operating costs. This results in a minimum-size line and a maximum number of pumping stations and for flexibility results in all stations being multiunit.

Because of need for flexibility, the system has quite a few junction points where products can be diverted through alternate routes to destination. These junction points and the military requirement for dispersion created some difficult problems in design.

After considerable delay, plans and cost estimates for projects started flowing into the Infrastructure Payments and Progress Committee for approval.

Problems in Implementing the Pipeline System

The problem of procuring material is a major item. NATO had agreed that all material purchased was subject to sary personnel was trained enough to make final plans.

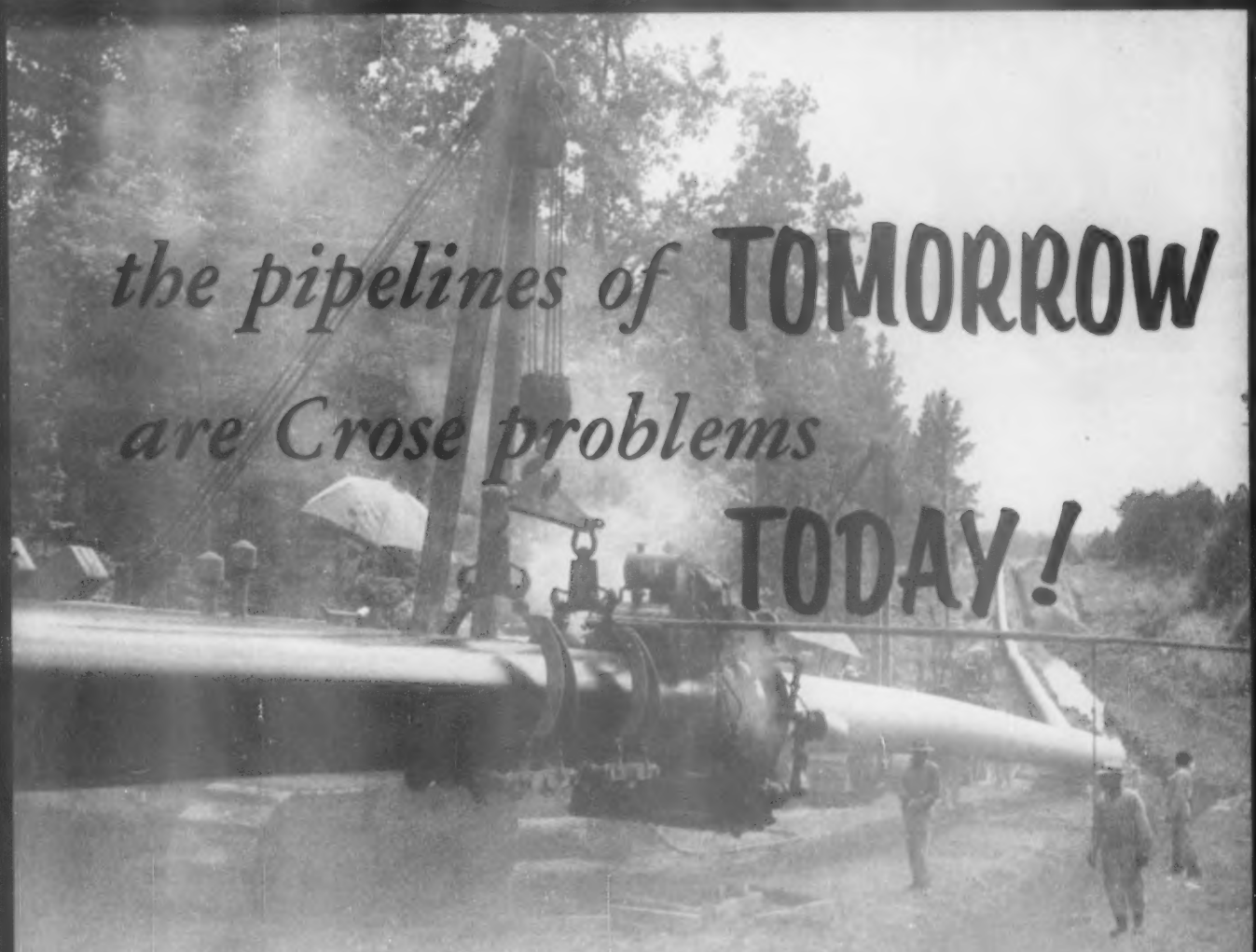
To assist in this problem, the NATO international staff issued many plans and documents setting forth policy for guidance in design and construction. These consisted of typical pump-station plans, tank plans, terminal layouts, manifold plans, specifications for construction of these units as well as for international competitive bidding for all member countries. There are differences in specifying material, contractual terms, custom regulations, and taxes between the various host countries. This resulted in considerable delay in placing orders because such problems had to be resolved and approved by NATO.

The same problems existed in awarding construction contracts. In some parts of the system, the military requirement for maximum standardization caused additional difficulties because several countries would have to purchase the same material at the same time under agreed conditions. The system for bidding, although streamlined as far as possible, is still time-consuming and is doubly so when several countries are involved simultaneously.

Odd laying practices . . . The construction of the pipelines raised the next problem. With the exception of a few companies there were no contractors equipped with pipe-laying equipment as we know it. Most of the contractors had some bulldozers but no sideboom tractors, bending machines, coating machines, road-boring machines, or lineup clamps.

However, because of the need for constructing the lines and the apparent lack of interest on the part of experienced foreign contractors in most projects, it was necessary to proceed with awarding contracts on the best price. This led to many strange practices in construction. For example, instead of skids being used on one job, metal chairs of uniform height were used to support the pipe for welding. A crew lined up the pipe by digging under the chairs for each section. The rate of construction was slow, but the results were satisfactory. On another job, no lineup clamps were used. Each section was aligned and braced and all other operations were stopped until the joint was welded.

In general, under these conditions, mill-coated pipe was used inasmuch as coating machines were unavailable. Pipe bends were usually factory-made from measurements taken in the field. In countries with large level areas and a considerable number of drainage ditches, it was found cheaper to ditch to eliminate bends than to have them made. Ditching machines were generally the ladder type. Over-the-front boom tractors were used in lieu of sideboom tractors, with a great deal of the pipe-handling work done by hand. The welding on most jobs was done "up hill." There were very few "downhand" welders available.



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Pipeline Patrol

On one job where the contractor had enough equipment, he found after a few days that it was cheaper to dispense with the equipment and use manpower for most operations except coating.

It must be said that in several countries, regular pipeline-construction equipment and methods as we know them are used. And progress of construction has been satisfactory and three to four times faster.

Another of the problems that was encountered was the lack of laws and regulations for pipelines. This resulted in some delay and, in some cases, some very restrictive regulations for rail, road, and water-course crossings. One country requires the casing under roads and railroads to be filled with sand after the pipe is laid. In another country, the laws do not allow common labor to be transported from their district, which results in the contractors having to discharge all of their unskilled labor and rehire new labor about every 6 miles of line.

Inasmuch as most rivers are navigable and are used heavily by barges, the depth of pipe below streambed is great. Also along canals, quite impressive construction methods are required in order to insure that no water is lost in making a crossing.

The construction of terminals is relatively simple inasmuch as most countries have had experience in tank construction and have excellent craftsmen in concrete construction. The major difficulty was in laying out manifolds to give the correct flexibility for pipeline operations.

The fact that many of the lines crossed national boundaries has created a problem of customs regulation which is under study.

Conclusion

In face of these difficulties, progress is being made in the construction of a complex pipeline system for NATO with an approved total of about 4,500 miles to date.

The major problem now facing NATO and the host countries is the organization, manning, and training of a competent operating organization. This problem passed its first hurdle late last year when NATO approved the proposed organization plan.

Inasmuch as the initial problem of getting construction started has been solved, it is believed the operating problem will be solved satisfactorily.

It appears that when the NATO pipeline system is completed, it will be one of the best logistic-support systems for fuels ever constructed.

New "all-in-one" well-servicing unit makes headlines in the oil field

From field operating reports comes news of the most advanced design in well-servicing units.

Phillips Petroleum has put together a rig that has large capacity, mobility, and ease of operation combined in a single compact unit. A 66-foot tubular steel derrick of 100,000 pounds capacity, a hydraulic pump capable of developing pressures up to the 2,000 psi necessary to raise and lower the derrick, and a single 37-inch drum winch that handles up to 6,500 feet of 2⅜" tubing or 7,200 feet of sucker rod —all operated by a 3-man crew— have been mounted on a Mack B-62SX chassis for heavy-duty operation in the oil fields.

The Mack B-62SX has power steering, air brakes, and a 10-speed transmission to meet any oil-field condition. For extra stability it is equipped with a safety brake requiring 75 pounds of air before the truck can be moved. The Mack engine operates on liquified petroleum gas with a 9.3-to-1 compression ratio, and has plenty of dependable power to operate the hydraulic pump, thereby saving the weight, space, and cost of an extra powerplant.

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Among the

Drilling Contractors

Stephens Production Co., Fort Smith, Ark., will drill as contractor on a 4,000-ft. wildcat test Stephen Investment Co., an affiliated company, has scheduled for Faulkner County, northeastern Arkansas. Location is for 1 Ward, in 13-8n-12w, southeast of Ender, and about 20 miles northeast of Conway.

C. M. Roberson Drilling Co., Shreveport, is drilling for O. B. Mobley, Jr., and George Belchic, Jr., at a wildcat location 10 miles southwest of Shreveport, in southwestern Caddo Parish, northwestern Louisiana. Location also is about 7 miles west of Bethany. Hole is projected to the Travis Peak at about 6,600 ft.

Gene Reid Drilling, Inc., Bakersfield, Calif., has contracted for a Vaqueros sand test to be drilled for Brookline Oil Co. at a wildcat location in the Shandon area, San Luis Obispo County, California. Location is in 16-27-16. Expected depth is about 6,000 ft.

Offshore Drilling Co., Baton Rouge, La., will drill F. W. Bates' projected 10,200-ft. wildcat test 6 miles northwest of the Cheneyville area, in Rapides Parish, southern Louisiana. Location, in 31-1n-1e, is about a mile northeast of Sartori.

R. L. Chance Drilling Co., Houston, will drill a 12,500-ft. test for Monterey Oil Co. at a wildcat location in the Houma area, Terrebonne Parish, Louisiana Gulf Coast. It will be Monterey's 1 Southdown, spotted in 104-17s-17e.

Miller Drilling Co., Jackson, Miss., is a joint operator with Norton Oil Co., of Shreveport, in putting down a 6,250-ft. test 6 miles southwest of Willetts, in Concordia Parish, eastern Louisiana. Location at 3-B Madison, in 15-6n-8e, is a wildcat, nearest production being in Horseshoe field, 4½ miles northwest. Objective is the Wilcox.

Crow Drilling & Producing Co., Shreveport, has scheduled an 8,500-ft. test to be drilled for **Tri-State Drilling Co.,** of Laurel, Miss., at a wildcat location 2 miles north of North Holly Ridge field, in southwestern Tensas Parish, eastern Louisiana. The test is listed as 1 Penrod-Jurden with location in 4-11n-10e. Objective is the top of the lower Cretaceous section.

Fortenberry Drilling Co., Natchez, Miss., is drilling a 5,700-ft. Wilcox test 5½ miles southeast of Waterproof, southeastern Tensas Parish, eastern Louisiana. Location, at 1-A Learned, in 14-9n-11e, is on Coles Point, about 3 miles northwest of North Church Hill field, across the Mississippi River, in Jefferson County, Mississippi. It is a contract job for D. A. Biglane, of Natchez.

J. I. Roberts Drilling Co., Shreveport, has a 10,500-ft. Haynesville test to drill for Sinclair Oil & Gas Co. Its location, 1 Griffin Unit, in 21-21n-5w, is on the east flank of West Lisbon field, in Claiborne Parish, North Central Louisiana.

Woolf & Magee, Tyler, Tex., are listed as contractors on five new tests Nebo Oil Co., Inc., plans to drill on

Sam Strickland (center), tool pusher and part-owner of Overby Drilling Co., Nowata, Okla., with E. L. Robinson (right), his driller, and Joe Ray Hendricks, helper. The contractor is drilling shallow water-flood wells in the Nowata area for Climax-Brundred Waterflood Division, of Climax Molybdenum Co.

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its fee lands in the Little Creek, Little Bayou, Northwest Trout Creek, and Nebo-Hemphill areas, west of Jena, in western LaSalle Parish, North Central Louisiana. They will be Wilcox tests with depths ranging from 4,300 to 4,500 ft.

Arrow Drilling Co., Tulsa and Dallas, is under contract to Monsanto Chemical Co., Southwest Gas Producing Co., and the Feazel interests, of Shreveport, for an 11,000-ft. Smackover test southeast of Shiloh, in Union Parish, North Louisiana. It will be the operators' 1 Grover. Location, in 28-21n-2w, is 2½ miles southeast of Bernice field.

Dorris Ballew, Inc., Natchez, Miss., has a rig working on a new deep-wildcat operation 4 miles northwest of Poplarville, in Pearl River County, southern Mississippi. Ballew has an interest in the operation with D. A. Biglane and S. B. Laub as joint operators. The test is their 1 Crosby, with location in 20-2s-16w. It is projected to 10,250 ft.

Sunnyland Contracting Co., Rayne, La., has a new contract job under way for Humble Oil & Refining Co. in southern Adams County, southwestern Mississippi. Its location is at 1-H Breaux et al, about a mile north of Lake Lucille field, near the Wilkinson county line. It is set up for a Wilcox test with hole expected to be carried to 7,300 ft.

A. W. Williams Drilling Co., Inc., Mobile, Ala., contracting company, has a rig running on a wildcat test it is putting down for its own account at 1 Hyde, in 27-6n-11e, 2 miles north of Evergreen, in Conecuh County, South Central Alabama. Hole will be carried to the top of the Lower Cretaceous about 4,400 ft.

Adkins Drilling Co., San Antonio, is getting under way on a 7,500-ft. wildcat it has contracted to drill for British Texas Oils, Ltd., also of San Antonio, in northeastern Atascosa County, near the Frio County line, Southwest Texas. Location, at 1 Byrd, in the T. R. Witten Survey, is 11 miles northeast of Pleasanton, and about 8 miles north of Pleasanton field.

Gilmour Drilling Co., Alice, Tex., has a new 8,000-ft. job 3 miles northeast of Banquete, in western Nueces County, lower Texas Gulf Coast. It is a contract operation for H. C. Hargrave and W. E. Colson, of Corpus Christi. Location is for 1 Elvira Prause Barnett, in the George H. Paul Subdivision of the Driscoll Ranch.

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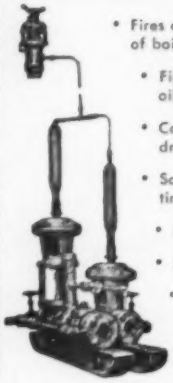

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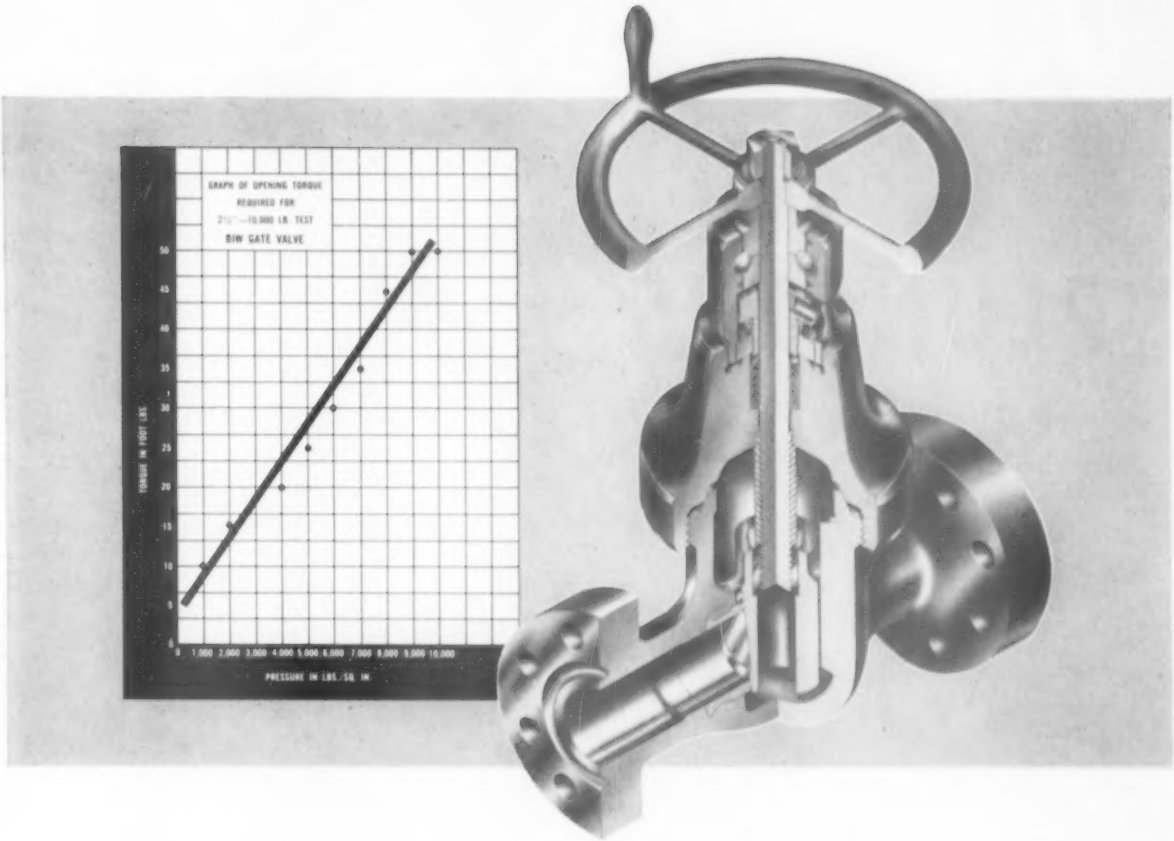

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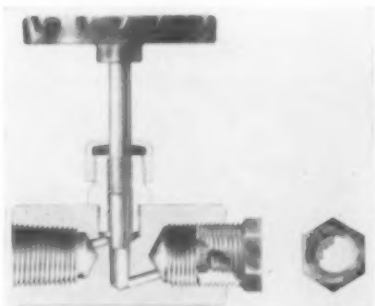

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Separator Is for High-Pressure Wells

This new horizontal separator is designed for liquid and gas separation from high-pressure oil and gas wells or other high-pressure liquid and gas streams.

The new d.c. separator features dual separation chambers in a single barrel and a mist extractor of knitted wire mesh that combine to provide high separation efficiencies. Pressure drop across the separator and mist extractor is very small. A new type inlet deflector produces maximum initial separation of liquid from the gas and permits in-line piping from the well-stream inlet and gas outlet. All controls are mounted at discharge end at standing level for easy adjustment and startup.

Easily adaptable for cold-weather operation and requiring a minimum of maintenance to keep it on the line, the d.c. separator is available in working pressures ranging from 500 to 7,500 psi. **For more information write or call: Black, Sivalls & Bryson, Inc., 7500 East Twelfth Street, Kansas City 26, Mo.**

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the OIL AND GAS JOURNAL **Showcase Coupon**

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Described in the June 4, 1956, issue of The Oil and Gas Journal

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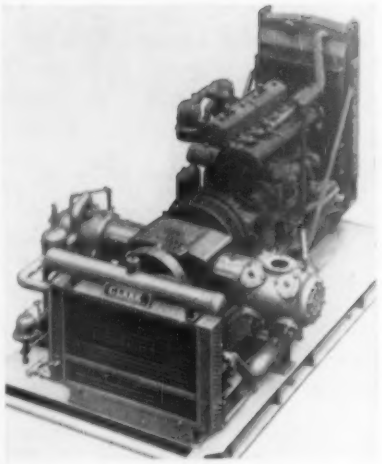
OIL AND GAS JOURNAL *Showcase* OF NEW EQUIPMENT

Packaged Compressor Built For Oil, Gas-Field Use

The new CFA packaged compressor has been specially designed for oil and gas-field use. It is well suited to gas gathering, gas lift, and other applications requiring a unitized compressor station in the 75-200-b.hp. range

The unit consists of a newly designed balanced/opposed compressor mounted on a steel skid and direct-driven by an oil-field-type gas engine. A radiator is included to permit intercooling of the gas between stages and to cool the lube oil and compressor cylinder jacket water. A scrubber and dumptrap can also be provided to remove condensate and moisture from the gas stream between stages.

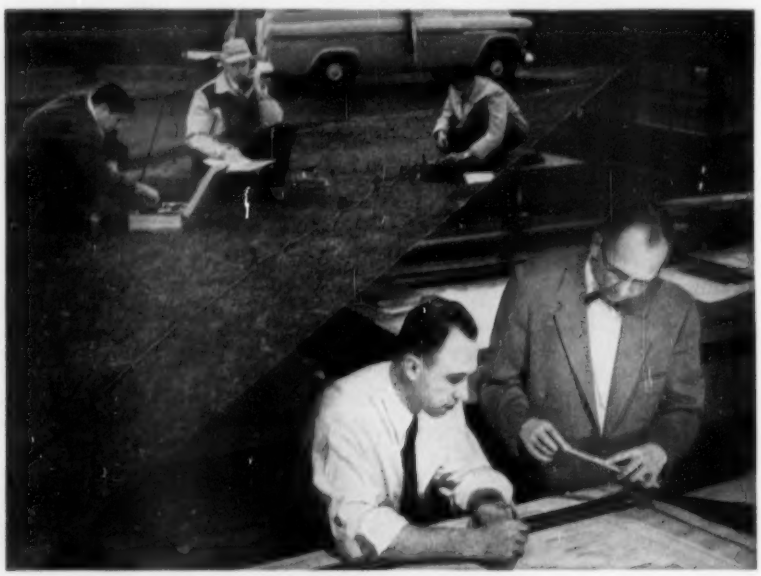
The CFA compressor has a 5-in. stroke and has two horizontally opposed compressor cylinders which project from opposite sides of the crankcase. The unit uses larger 8, 14, and 17-in. stroke balanced/opposed compressors. In this design the compressor cylinders, which are mounted on opposite sides of the crankcase, are driven from crankshaft throws which are 180° apart.



Reciprocating masses are always moving in opposite directions. Because each reciprocating force is opposed by an equal and opposite force, there are no unbalanced vertical or horizontal forces in the CFA. All of the reciprocating components are carefully weighed and matched.

The CFA is also readily adaptable to operation on floating barges for use in the bayou country or on trucks and trailers when a portable unit is required. **For more information write or call: Clark Brothers Co., Olean, N. Y.**

●



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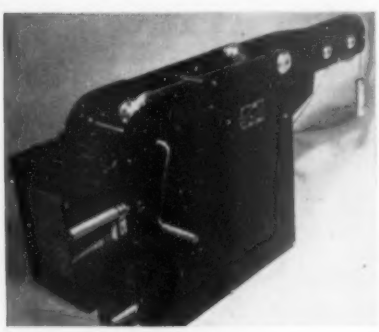

Portable Logger Gives Shot-Hole Radiation Log

The Model GHL-230 logging system includes a portable reel, a geiger counter with a watertight probe, and a recorder which provides a record of radiation intensity as a function of depth in the hole being logged.

All bearings, drive mechanism, and slip rings of the reel are totally enclosed as protection against dirt and moisture. The drive for the footage indicator and recorder chart movement is positive and without backlash. The probe is positioned with respect to the

hole by means of a boom which extends forward from the reel. For convenience in transport, the boom folds down inside the reel. Each probe is tested under water at a pressure of 1,000 psi. to insure satisfactory operation in water-filled holes.

The recorder-geiger counter can be attached or detached from the reel in less than a minute, resulting in two easily carried packages. Because of the short set-up time, ease of transport, and reliability under field conditions, the GHL-230 logger is recommended as a seismograph shot-hole logger. **For more information write or call: Mount Sopris Instrument Corp., 1320 Peal Street, Boulder, Colo.**

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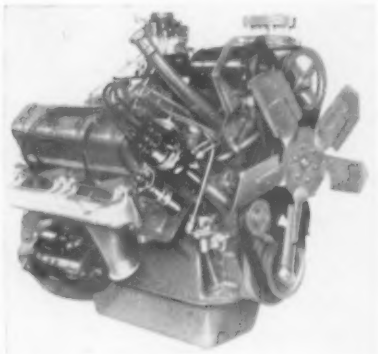


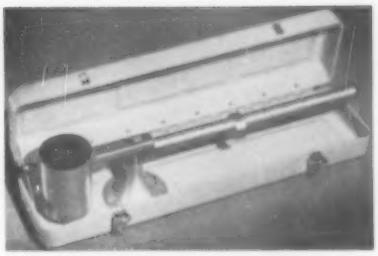
I-H Introduces V-Line Of Heavy-Duty Trucks

A new V-line of heavy-duty trucks features three new V-8 engines. Nine series of trucks in conventional and cab-over-engine, four and six-wheel design, comprise the V-line. Models are available with gross vehicle weight ratings of 24,000 lb. and up, and gross combination weights of 50,000 lb. and up.

Power is supplied by new V-8 engines of 401, 461, and 549-cu.-in. displacement with horsepower ratings of 206, 225, and 257, respectively.

Short, rigid construction, lightweight and low-friction design are characteristics of these new V-8 engines. They deliver high usable horsepower and torque at safe, economical r.p.m. to assure maximum engine efficiency in all normal driving ranges.

Conventional four-wheel models are available in the V-line in the Model V-195 and the V-200, and V-220 Series; and conventional six-wheel models are included in the VF-190 and VF-200 Series. Cab-over-engine models are available in the VCO-195, the VCO-200 Series, and the VCO-220 Series. **For more information write or call: International Harvester Co., 180 North Michigan Avenue, Chicago 1, Ill.**



Mud Balance Is Corrosion Resistant and Sensitive

The Model 11 mud balance is easy to use, lightweight, sensitive, and resistant to corrosion. It features an integral cup and beam with sharp, legible figures which are read from the top; a shock-mounted level vial protected by unbreakable plastic; and a hard-rubber cover for the cup, weight-matched for replacement if necessary. Since all metal parts are streamlined, anodized, and highly polished, they are free of mud-catching pores and corners.

The new rubber-plastic carrying case is impervious to water and unaffected

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by the chemicals in mud. The balance and case weigh about 4 lb. **For more information write or call: Fann Instrument Corp., P. O. Box 6101, Houston 6, Tex.**

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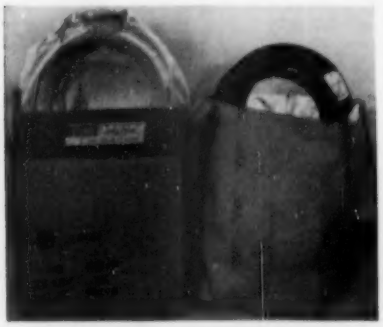


V-Belts Sealed in Package To Prevent Shrinking

V-belts change length in storage because of temperature and humidity changes. This means belts must be measured at the time of sale and installation to get sets that are matched in length. Even then, some belts will stretch more than others after running. An answer to the problem of matching V-belts on a multiple V-belt drive is this special vacuum-sealed, moisture-proof packaging which prevents shrinkage.

This makes it possible for V-belts to be delivered to the oil field and installed in exactly matched sets. **For more information write or call: Raybestos-Manhattan, Inc., Manheim, Pa.**

●

Electro-Span Is Offered For Remote Supervision

A new tank-gaging system remotely measures liquid levels in tank farms of any size over a single wire-pair of any length leading to the tank-farm area. The operator of the receiver selects the tank he wishes to measure, causing the selected tank to begin automatically to transmit data. The tank number then lights up in a group of lamp registers on the left of the panel. Almost instantly, in light-register groups to the right, a reading of the liquid level in the tank in feet, inches, and fractions of an inch will appear.

The Electro-Span remote tank-gaging system will read liquid levels to 64 ft. in ⅛-in. increments.

The system will read and hold or scan tank farms automatically. Average temperature can be determined and transmitted with the liquid-level information. Cyclic timers can be used, also, to make readings at preselected times. Coding is such that recorded readings may be made into electric typewriter or on punched cards.

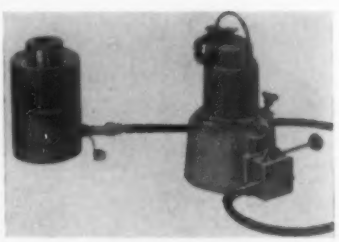
Electro-Span systems can be set up to have remote receivers in several locations. Receivers might, for example, be installed in the refinery office, accounting department, and in the pipelining scheduling office. **For more information write or call: Pacific Division, Bendix Aviation Corp., North Hollywood, Calif.**

●

Air-Operated Hydraulic Pump Speeds Jack Use

This new air-powered hydraulic pump, known as No. P7A, is usable with all single and two-way Simplex Re-Mo-Trol rams. It lifts seven times faster than a hand pump. It has a displacement of 42 cu. in. of oil per minute and will raise a 60-ton-capacity ram 1 in. in 20 seconds.

Used with Re-Mo-Trol rams, the P7A pump provides combination units with capacities from 10 to 600 tons. The rams lift, push, or pull up, down, sideways, or at any angle and the center-hole feature of Simplex rams greatly simplifies rigging in many pulling applications. The pump provides 11,000-psi. hydraulic pressure at 90 psi. to move heavy loads smoothly.



The P7A pump weighs 44 lb. Oil reservoir has a 4-qt. capacity. A selector valve reverses the flow of oil to raise or lower ram plunger on two-way rams. A variable pressure-control valve regulates hydraulic operation. **For more information write or call: Templeton, Kenly & Co., 2525 Gardner Road, Broadview, Ill.**

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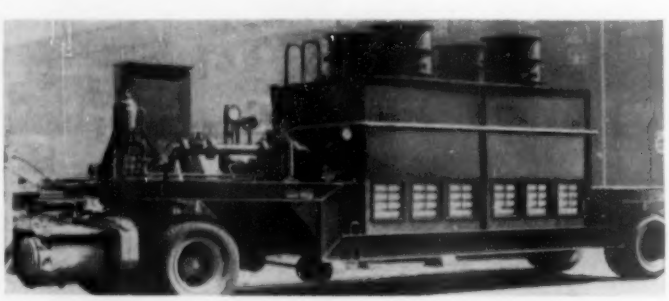


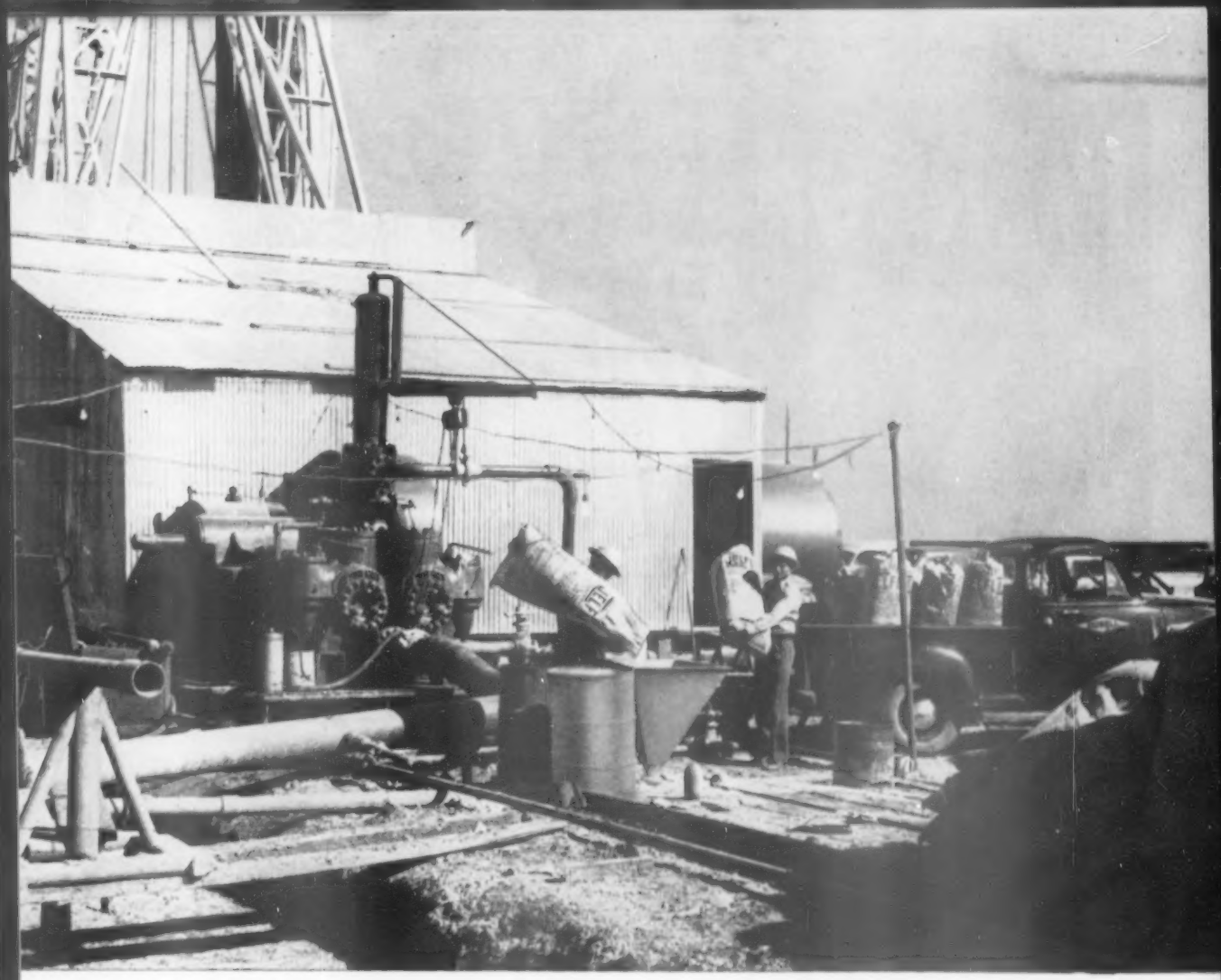
Water-Cooling Tower Is Truck-Borne

A portable water-cooling tower may be the answer to a number of industrial situations where limited cooling-water supplies have been a production bottleneck.

The unit is a complete package plant on wheels. Compact and lightweight, it is equipped with all necessary accessories such as pumps, strainers, electrical control equipment, pressure gages, thermometers, and feed-water conditioner. Design capacity of the unit shown is 240 g.p.m. of 115° F. water reduced to 90° F. when operating at 95° F. air temperature and 80° F. wet bulb.

The tower is presently being used in conjunction with portable oxygen-generating plants in remote locations. Small chemical plants could use it. It could be used with a small diesel power station with large volumes of cooling water to recirculate.

The tower pictured is constructed of steel and is packed with 20-in. fiberglass. The entrainment separator is a special copper mesh, and the four axial flow fans have a capacity of 11,000 c.f.m. each. The entire cooling plant can be shipped as a unit. **For more information write or call: Badger Manufacturing Co., Cambridge, Mass.**



JELFLAKE

Durable DOWELL flakes seal "thief" zones to stop drilling mud or slurry losses

Here is effective protection against mud circulation losses . . . protection that is *not* affected by decay, water, oil, mud chemicals or high temperatures . . . nor does it form tannic acid. It is Jelflake ®—an easy-to-use, fragmented plastic foil by Dowell.

Feather-light Jelflake, only 1/1000 of an inch thick, is scientifically designed to stop mud or slurry losses quickly, dependably, permanently. Its tough plastic particles both plug and plaster "thief" formations. Smaller fragments penetrate deep to stop up passages; larger ones flatten out tight against the wall of the hole.

To gain greater circulation protection per dollar, simply add Jelflake to drilling mud or cement slurry. Jelflake remains in suspension almost indefinitely. It will neither ball up nor clog equipment. One 25-pound bag can cover over 500,000 square inches.

Jelflake is available in strong, wetproof bags at major mud distributors and local Dowell stations. For more information, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma, Department F-11.

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OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

The Microballoon Layer Reduces Evaporation Losses. Crude oil saved in less than 2 years can recover the cost of installing microscopic plastic spheres in a storage tank, according to this new booklet. The tiny spheres are made of phenolic resin and filled with sealed-in gas. Pumped or dumped into the tank, millions of the spheres form a surface blanket which field installations show can cut crude-oil losses as much as 80 to 90 per cent. The 12-page booklet employs graphs, tables, and photographic illustrations to describe the spheres themselves; how they are packaged, shipped, stored, installed, and maintained in crude-oil tanks, and how a specially designed portable gage well measures the oil in a tank covered with Microballoon spheres. **For more information write or call: Bakelite Co., Division of Union Carbide & Carbon Corp., 300 Madison Avenue, New York 17, N. Y.**

●

Permanent Completion Equipment. This catalog covers the design and operation of wire-line removable equipment required in permanently completed wells. It also covers seating nipples incorporated in the tubing string for both singly and dually completed wells and the running and pulling tools used with the equipment. **For more information write or call: Pressure Services, Inc., 137 Walnut Hill Village, Dallas, Tex.**

●

Interior Pipe Coatings and Tank Coatings are explained in an illustrated specifications bulletin. Pipe coating 836-R-10 is described as offering durable protection after one-coat application, without puddling or washing. When dry and cured, it retards corrosion, eliminates scale and paraffin deposits, reduces decomposing effects of electrolytes, and actually raises the coefficient of flow. Pipe can be returned to service as quickly as 6 hours after treatment. Interior tank coating 836-R-9 is described as having excellent resistance to damage from crude oil, most petroleum products, and salt or fresh water. The controlled heavy body

gives uniform 5 to 6-mil thickness in one coat. **For more information write or call: Cook Paint & Varnish Co., Department OJ, P. O. Box 389, Kansas City, Mo.**

•

Croloy Steel Pipe and Tubing for High-Temperature Service. Engineers and others involved with the design or maintenance of processing equipment involving the use of tubular products at high temperatures will be interested in this six-page folder, TDC-163A. The folder furnishes information on analysis, mechanical and physical properties, and creep and rupture data, on many of the various tubing alloys which are proven satisfactory in elevated temperature service. **For more information write or call: Babcock & Wilcox Co., 161 East Forty-Second Street, New York, N. Y.**

•

Teflon Packings. A new eight-page bulletin illustrates and describes split and folded types of envelope gaskets, solid gaskets, and Teflon stuffing box, Vee-Flex, braided, plastic, and various types of valve-stem packings. Complete service recommendations for each type packing is included as well as sizes in which they are available. The bulletin also includes complete information on the properties of Teflon. **For more information write or call: Raybestos-Manhattan, Inc., Packing Division, Manheim, Pa.**

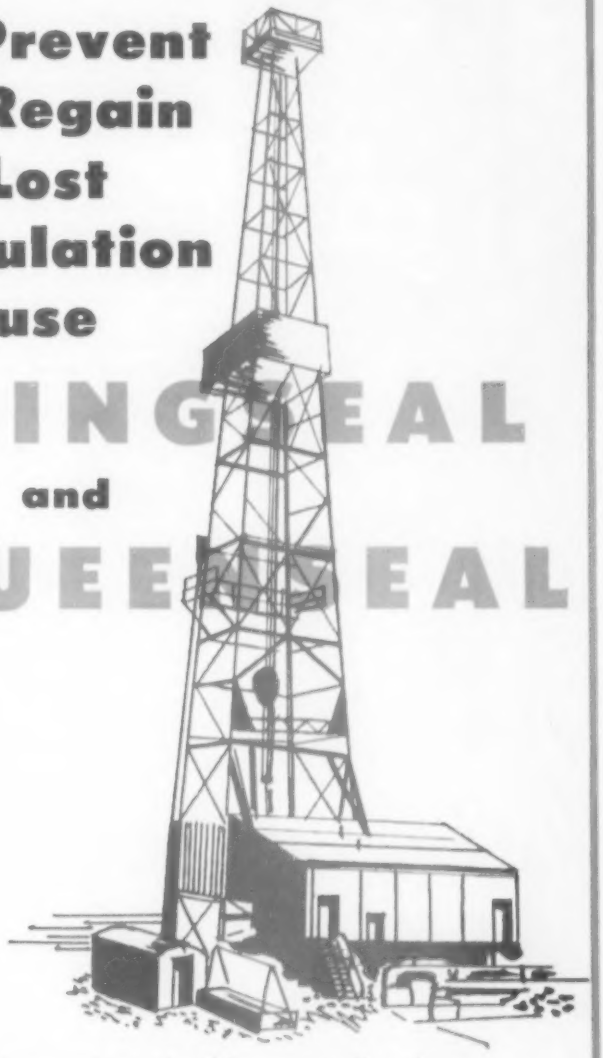
•

Steel Floor Armor. An illustrated booklet describes the uses of steel floor armor to prolong the life of floors. It shows both the application and installation of Hexteel heavy-duty floor armor and Floorsteel flexible-type floor armor. Hexteel is a steel surface armor designed to take the brunt of rolling loads and to increase the life of industrial floors, ramps, docks, aisles, highway and railroad bridges. Floorsteel is a flexible floor armor which rolls out like a rug. It is suitable for armoring irregular surfaces. **For more information write or call: Klemp Metal Grating Corp., 6601 South Melvina Avenue, Chicago 38, Ill.**

•

Industrial Waste Treatment Handbook, an eight-page bulletin, outlines equipment for use in industrial waste treatment. The handbook mentions three purposes in treating industrial wastes: recovery of valuable materials, clarification of process liquids for reuse, and elimination of pollution. Rex equipment is available for any industrial plant where treatment of process liquids is necessary, such as oil refineries. Pack-

To Prevent or Regain Lost Circulation use KINGSEAL and QUEENSEAL



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For harder than usual pumping -- double contact with the ball.

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A 2-piece stainless steel seat specially recommended where ordinary or fracturing sand is causing seat failures.

"Sheralloy" Seat
A cast alloy definitely proved resistant to corrosion. Also good for hard pumping.

For best service use the right Baird ball with the right Baird seat.

age industrial waste treatment equipment is also briefly described in Bulletin 315-111. The Rex Verti-Flo removes settled solids, and the Rex Float-Treat removes suspended materials. **For more information write or call: Chain Belt Co., Milwaukee 1, Wis.**

●

Sealed Contact Thermoregulators. Bulletin 649 describes a line of sealed contact thermoregulators. The new bulletin discusses the three models of regulators, both adjustable and preset models, and such features as range, sensitivity, and construction. **For more information write or call: Precision Scientific Co., 3737 West Cortland Street, Chicago 47, Ill.**

●

Verticlosed Pump Motors. Bulletin 1903 has 66 full-colored illustrations and technical drawings depicting features and applications of various types of vertical-turbine pump motors. It describes hollow-shaft verticlosed grease and oil-lubricated motors in sizes from 1½ to 400 hp.; also single phase designs up to 7½ hp., and totally enclosed types up to 150 hp. Graphs showing relation of thrust-bearing life to contact angle and starting characteristics of part-winding increment start motors are of special interest to pump engineers. **For more information write or call: U. S. Electrical Motors, Inc., Box 2058, Los Angeles 54, Calif.**

●

Sandlock for Blocking Loose Sands is the subject of a four-page, multicolor leaflet. The same service equipment is used for Sandlock jobs as are used for acidizing sand fracturing. Oil is first pumped into the well to establish an injection rate and treating pressure. Plastic-coated walnut shells are mixed into the oil and pumped into the formation. The plastic sets up, and the sand-blocking network is formed. **For more information write or call: Dowell Incorporated, Tulsa 1, Okla.**

●

Industrial Waste Treatment. Several practical systems for process and wastewater treatment are presented in Technical Paper No. 64. The utilization of controlled volume pumps to meter chemicals and additives are described in this bound report. In the area of water treatment, such processes as coagulation, clarification, boiler water treating, and oxygen scavenging by Hydrazine addition are discussed in detail. **For more information write or call: Milton Roy Co., Station L, 1300 East Mermaid Lane, Philadelphia 18, Pa.**

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Series 150 (Single Bowl) Bowen Releasing and Circulating Overshots are compact units made up of a Top Sub, a Bowl, and a Guide. They can be dressed with standard parts to engage and pack off a specific maximum size or with undersize parts to engage and pack off any smaller sizes.

SIMPLE AND EASY TO DRESS: If the O.D. of the fish is close to the maximum catch of the Overshot, only three parts are required to dress it to engage and pack off. If the O.D. of the fish is somewhat below the maximum catch of the Overshot, only two parts are required to dress it to engage and pack off.

SETS AND RELEASES TO THE RIGHT so fishing string is never turned in unscrewing direction—a vital safety point.

POSITIVE GRIP—POSITIVE RELEASE. The greater the pull, the tighter the grip—yet in releasing operation Grapple will expand and actually let go of the fish.

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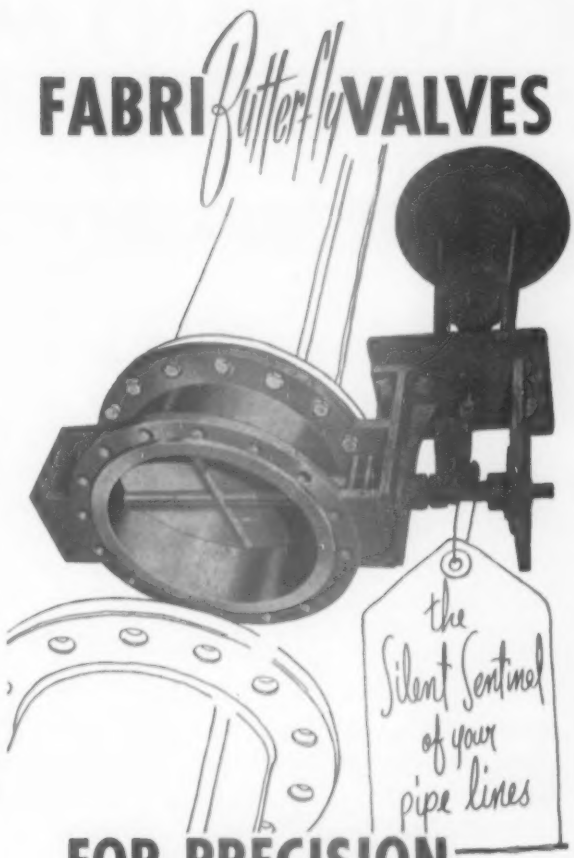

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DOUGLAS ROBBINS & CO.	Minooka, Ill.
SOUTHERN CORP.	Charleston, S. C.

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Greer Assumes Presidency of George E. Failing Co.

R. M. GREER

The appointment of Robert M. Greer as president of George E. Failing Co. of Enid, Okla., has been announced by the Failing board of directors after accepting the resignation of Paul Courtney. Courtney did not announce his future plans.

Greer was formerly Failing's first vice president. He has been associated with the Failing company for the past 22 years.

The Failing company, which manufactures portable drilling rigs, is a subsidiary of Westinghouse Air Brake Co. of Pittsburgh, Pa.

Talbert Is Assistant Chief Engineer for Security

M. L. TALBERT

Mi'ton L. Talbert of China Springs, Tex., has been named assistant chief engineer for the Dallas rock-bit-plant operations of Security Engineering Division, one of the Dresser Industries, according to Carl Lichte, chief engineer. Talbert's appointment is part of the current expansion of Security's engineering department.

Talbert was connected with another major bit manufacturer from 1936 until 1952.

Oilwell Appoints Field, District Representatives

The appointment of John W. Porter as field representative at Abilene, Tex., for U. S. Steel's Oil Well Supply Division has been announced by William Miskimins, Central Midwest area manager of the division, and William S. Cole and James W. Andrews, Sr., have been named district representatives at Beaumont, Tex.,, according to M. F. Jones, Gulf Coast area manager.

Porter was employed by Oilwell in 1948 at Wichita Falls, Tex., and in 1950 was transferred to Abilene. Cole joined Oilwell in 1954 as city representative in Houston, where he was located prior to his present appointment.

Andrews was first employed by the division in 1945 as field engineer at Houston. He later served in the same capacity at Jennings, La. In 1949 he became field representative at New Iberia, La., later becoming district representative at Beaumont, and in 1951 became field representative at the same location.

Abegg & Reinhold Adds Gilbert to Sales Staff

The appointment of Jesse Gilbert, Jr. to the sales staff of Abegg & Reinhold Co. has been announced by Inky Wotkyns, Mid-Continent sales manager. Gilbert joins Bill Chilcutt in the State of Oklahoma on Varco sales.

Gilbert will headquarter at Ardmore. He previously served as a roughneck for Warren-Bradshaw and Viersen Cochran. He was later employed by Gerold M. Young Exploration Co. and subsequently joined Baash-Ross, leaving that firm early in 1956 to join Abegg & Reinhold.

Chilcutt has had experience with Bovaird Supply Co., Well Equipment Manufacturing Corp., and became office and warehouse manager for Harrisburg Sales & Service Co. In 1954 he joined Abegg & Reinhold Co.

Meaders and Gunn Touring Halliburton Sites in S. A.

L. B. Meaders, president of Halliburton Oil Well Cementing Co., and Vander V. Gunn, manager of Latin American operations, have begun an extensive tour of Halliburton's operations in Venezuela, Colombia, and Peru. Above, Meaders, left, and Gunn inspect a relief map of Venezuela. During the trip the pair will tour Halliburton operations in the three South American countries.

Hughes Tool Names Four Sales Managers

Promotion of Shelby R. Chambless from special representative to sales manager of the Ark-La-Tex district and

S. R. CHAMBLESS

J. W. ROACH

J. W. Roach from special representative to sales manager of the Lake Charles district, is announced by Wade W. Hampton, manager of the southern

FLEETWOOD

ALEXANDER

region of Hughes Tool Co.; transfer of Clyde W. Fleetwood to North Texas as division sales manager, and F. T. Alexander to Houma, La., to sales manager of the newly created Southeast division, is announced by W. H. Siems, general sales manager.

Both Chambless and Roach have had considerable experience in the districts they now serve. Chambless was for a number of years export division manager for the company in northern South America.

Prior to his new assignment, Fleetwood was sales manager of the Ark-La-Tex division. Alexander, who for a number of years specialized in tool-joint sales, was South Louisiana district sales manager before being moved to Houma to replace Fleetwood.

Weatherford Names Norwood Sales, Service Engineer

Glyn D. Norwood has been appointed sales and service engineer for Weatherford Oil Tool Co. in the firm's North Texas area.

Norwood worked for Norwood Drilling Co. from 1939 to 1955 as a rough-

The Orbit Forged Steel Valve is an engineered product.

. . . . Meter Runs . . Christmas Tree Service . . . Flow Lines . . .

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. . . . Separators . . . Treaters . . . . . Manifold Systems . . . .

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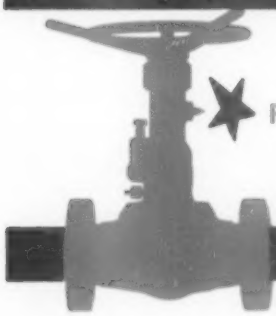

For general oil field production use.

See 21st (1955-56) Edition Composite Catalog for details.

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neck, driller, and tool pusher. In 1955 he formed Norwood Well Service Co. which he owned and operated before joining Weatherford.

Girdler Co. Elects Wood As President

W. R. WOOD

W. Roberts Wood has been elected president of The Girdler Co., Louisville, Ky., a division of National Cylinder Gas Co., Chicago. The announcement was made by Charles J. Haines, president of National Cylinder Gas, following a meeting of the corporation's board of directors.

Wood succeeds George O. Boomer, who retired. Boomer will continue as chairman of the executive committee of National Cylinder Gas Co.

Wood was with E. I. du Pont de-Nemours & Co. before joining Girdler in 1929. In 1939 he was made manager of the gas processes division, was elected vice president in 1941, executive vice president in 1948, and in 1953 became a vice president and director of National Cylinder Gas.

Fleming Elected A Vice President by Welex Jet

J. B. FLEMING

John B. Fleming has been elected a vice president of Welex Jet Services, Inc., Ray O. Shaffer, president of the oil-well-service company, has announced.

Fleming, Gulf Coast manager for Welex, has been in oil-well-service work for 17 years, the last 5½ of which have been with Welex. He was at one time Corpus Christi manager for Welex.

Homco Opens New Office In Lafayette, La.

Houston Oil Field Material Co., Inc., has opened a new sales and service office in the Oil Center of Lafayette. The following personnel will be located in Lafayette: C. H. Pollard, assistant general manager, directional drilling in Louisiana and Mississippi; Leon LaBauve, service representative; J. O. (Jack) Duncan, oil-field-supplies sales; Gordon Harrigan, directional drilling sales engineer.

Delta Tank Names Davis to Sales-Engineering Staff

Appointment of Ted G. Davis to the sales-engineering staff of Delta Tank Manufacturing Co., Inc., has been announced by Ross B. Baze, vice president in charge of sales for Delta's oil-field equipment and special-order products division.

Davis formerly was active with a tank fabricator in Houston and New Orleans.

Wilson Heads Sales For Midwestern Pipe Line

JOHN WILSON

John Wilson has been elected vice president in charge of sales for Midwestern Pipe Line Products Co. of Tulsa, according to O. E. Murrey and A. H. Bost, president and executive vice president, respectively, of the Tulsa firm. Wilson has been with Midwestern for 9 years, the last 2 of which have been spent in Tulsa as sales manager. He previously managed the company's Pittsburgh office.

Perkin-Elmer Appoints Instrument Sales Director

HUTCHINSON

The appointment of Paul C. Hutchinson as director of sales of the instrument division of The Perkin-Elmer Corp. has been announced by Dr. Van Zandt Williams, general manager of the division. Hutchinson joined Perkin-Elmer in 1955 as sales manager for the company's laboratory analytical instruments. He had formerly been associated with an instrument manufacturer as sales manager.

In his new position, Hutchinson will be responsible for the sale of laboratory analytical instruments as well as for the sale of infrared analyzers for the continuous control of chemical streams in process plants.

I-H Construction Equipment Shown at Press Meeting

A showing of International Harvester Co.'s complete line of construction equipment recently was staged at the company's Dundee, Ill., proving ground. The equipment demonstration climaxed a 2-day press gathering designed to illustrate International's large growth in the past 5 years.

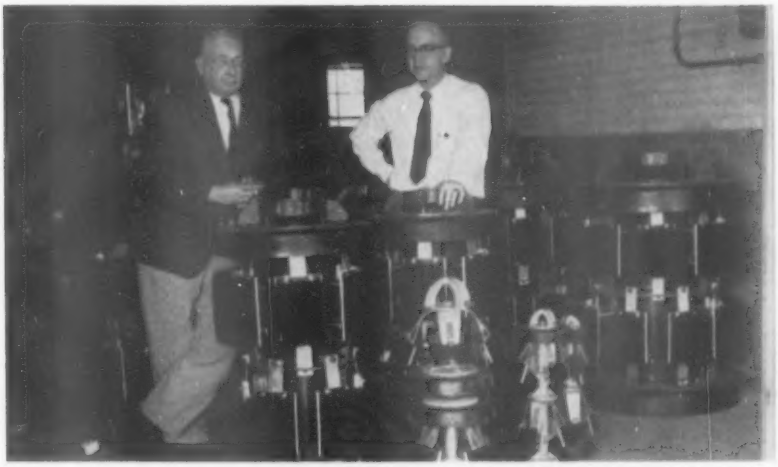
International now produces seven models of crawler tractors, 18 power units, three sizes of four-wheel scrapers, two self-propelled scrapers, two new off-highway trucks, a self-propelled, bottom-dump wagon, five International Drott skid shovels, and the new rear-engine Payloader.

In addition, the Frank G. Hough Co., a wholly owned subsidiary, produces six rubber-tired, rear-engine, front end loaders.

International also manufactures 228 different attachments to be used with its equipment, including upwards of 42 new bulldozers and bullgraders.

Of particular interest to the petroleum industry was the new TD-18 crawler tractor. Among its major features is increased horsepower. Its rugged six-cylinder diesel engine now gives 103 drawbar horsepower, which moves the TD-18 model up into the big tractor class.

Everything is within easy reach in the operator's compartment of 103 drawbar horsepower International TD-18 crawler tractor. Other operator features include new hydraulic power steering and positive, selfenergizing brakes. TD-18 develops 24,300 lb. drawbar pull.



Aramco To Use T. D. Williamson Pigs in Saudi Arabia

K. P. M. Orrell, engineering representative of Arabian American Oil Co., and T. D. Williamson, Jr., vice president of T. D. Williamson, Inc., Tulsa, are shown making the final inspection of a large order of WmSON pipeline-cleaning pigs (scrapers) to be shipped to Saudi Arabia for use in Aramco's extensive pipeline system.

Enardo Appoints Lofstrand For Western Canada Sales

Verner G. Lofstrand has been appointed sales representative for the western provinces of Canada by Enardo Manufacturing Co. of Tulsa. Lofstrand has completed a 6 weeks' training period in Tulsa. Areas such as East Texas, Oklahoma, Kansas, and other oil-producing states have been studied during the training.

Lofstrand has spent the past 5 years in the Canadian oil-field-supply service. He was with Jones & Laughlin Sales Service Co. at Steuter, Alta., before joining Oil Equipment, Ltd., a Canadian independent supply company. Prior to coming to the Enardo office for training, Lofstrand was employed by Dutton-Williams Pipe Line Construction Co. and Maple Leaf Petroleum Co. in the Steuter area.

Roberts Assigned to Enterprise L. A. Office

J. L. Roberts, sales engineer, is newly assigned to the Los Angeles branch office of Enterprise Engine & Machinery Co. Named to the territory by A. W. Ostrander, general sales manager of the San Francisco diesel-engine builder, Roberts joins Roy Hogaboom, branch manager, to provide special service to marine and contractor diesel needs.

With Enterprise since 1946, Roberts has been associated with the company's New Orleans offices for the past 4 years. Prior to that he served in the Enterprise design engineering department.

FWD To Build Duncan, Okla. Sales and Service Center

Plans for a new branch sales and service center to be constructed by Four Wheel Drive Auto Co. at Duncan have been announced by G. F. DeCoursin, FWD sales vice president. The new branch is expected to be completed in the early fall.

The new sales and service center will consist of two buildings, one housing parts and shop facilities and the other sales offices and conference rooms. The center will provide space for carrying stock trucks for faster delivery to FWD customers.

Forsyth Heads Lane-Wells L. A. Plant Activities

Val L. Forsyth, formerly chief engineer and more recently technical assistant to the president, has been appointed manager of manufacturing, engineering and purchasing of Lane-Wells Co., one of the Dresser Industries, according to John J. Neale, Lane-Wells president.

Forsyth joined Lane-Wells as a rigman in 1938 and advanced through Mid-Continent and field service engineering to become chief engineer in 1952. He will have charge of all engineering, purchasing and manufacturing activities in Lane-Wells Los Angeles plant.

W-K-M Elects B. J. Gross Marketing Vice President

B. J. GROSS

The election of B. J. Gross as vice president for marketing has been announced by J. S. Downs, president of W-K-M Manufacturing Co., Inc., of Houston. Gross was president of the former Key Co. which became a part of W-K-M as a result of the recently announced consolidation.

Gross was with the former Key Co. for 23 years. He started in the sales department, later became vice president in charge of sales, and in 1948 was elected president of that company.

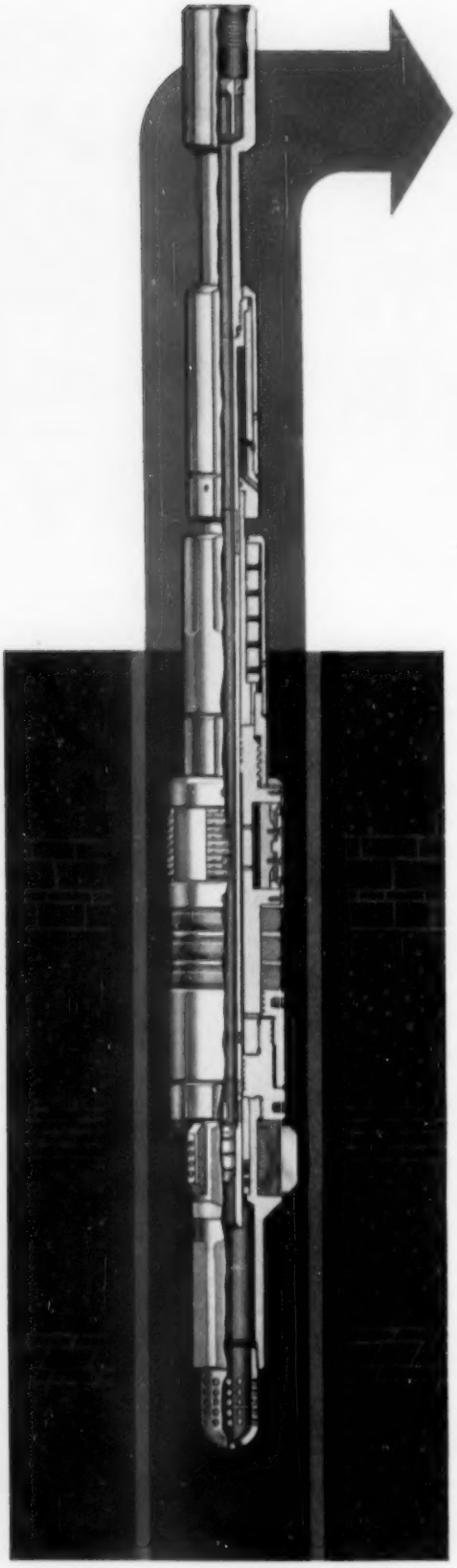
LeBus Appoints English, German Representatives

LeBus International Engineers, Ltd., Longview, Tex., recently announced the appointment of Woodfield Hoist & Associated Industries, Ltd., of Rochester, Kent, England, and Hermann von Rautenkranz-Itag of Celle, Germany, as sales and service representatives for LeBus. These firms will serve LeBus in Europe, the Middle East, and North Africa.

Lonnie Thompson, sales engineer for LeBus, has just returned from a 3-month trip to Europe at which time he trained service engineers for both the English and German firms in the installation of the LeBus counterbalance spooling system.

The LeBus manufacturing plant is in Longview while sales and service engineers are located throughout the United States, with sales and service representatives in Canada, Mexico, and South America.

Shown above are Gordon Fraser, chief sales engineer for Woodfield Hoist & Associated Industries, Ltd., and Lonnie Thompson, sales engineer of LeBus International Engineers, Ltd.



RETRIEVABLE TOOL CUTS SQUEEZE TIME COST!

HALLIBURTON'S *hydraulic* RETRIEVABLE CEMENTER

If every oil well had a money meter... ticking away the dollars of rig cost and lost production time during remedial work... even more squeeze jobs would be done with Halliburton's time-saving Hydraulic Retrievable Cementer (HRC). As it is, thousands of profit-minded oilmen are sold on Halliburton's HRC for fast, efficient, one-trip squeeze cementing.

ONE ROUND TRIP FOR A NUMBER OF JOBS

Big reason for this tool's speed: it can be set, released and reset for any number of squeeze jobs on a single down-hole trip. Another: no packer drilling-out time, because Halliburton's HRC comes out of the hole when the job is done. Also, the tubing is automatically pressure tested as the packer is set. And the hydro-mechanical design makes for reliability, ease of run-in, and simplicity of manipulation at the pack-off point. Why shouldn't it give better service... it's a cementing tool designed out of the longest, broadest cementing experience in the history of oil wells.

Let one of Halliburton's trained operators show you how fast and economical precision squeeze cementing can be with a Hydraulic Retrievable Cementer. Call your local or district office of Halliburton Oil Well Cementing Company.

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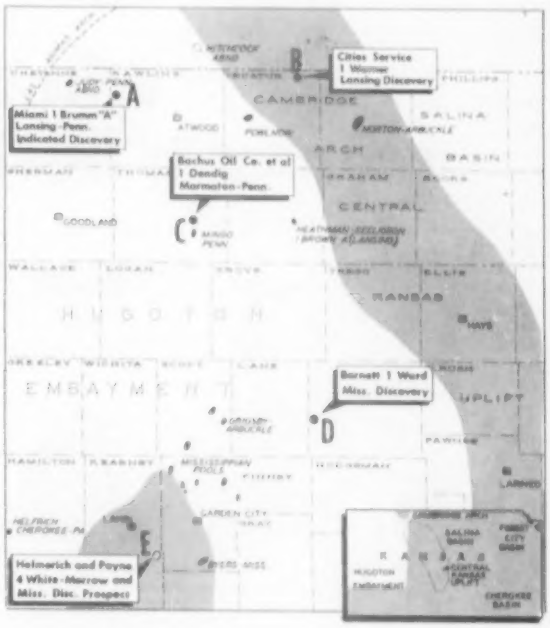
250 SERVICE CENTERS – JUST MINUTES AWAY FROM ANY RIG

EXPLORATION

Seven Strikes . . . And Kansas Still at Bat

by Frank J. Gardner



Seven successful wildcats have hit pay dirt in western Kansas in the past month. These new pools, plus the multiple showings recorded on the way down, point to an active drilling era ahead for all of Kansas' western counties.

NOTE to Rocky Mountain oil finders: look east. Note to Mid-Continent oil finders: look west.

A veritable shower of discovery wells has spotted the map of western Kansas' Hugoton embayment province the past month, and at deadline time, it has spilled over into southern Nebraska. Oil operators in both the Rocky Mountain and Mid-Continent provinces should be gratified with these successes, for they throw open wide new vistas for exploration. All these strikes are in rank wildcat country.

New plays . . . At A on the map, the wildest of them all is Miami Operating Co. 1 Brumm "A," in Section 7-2s-36w, Rawlins County. It doesn't look like a world-beater of a well, but if successfully completed, it could swing the Denver-Julesburg play over the Las Animas arch toward Pennsylvanian objectives in Kansas. It is swabbing 2 bbl. of oil per hour from Lansing-Pennsylvanian perforations at 4,410-18 ft. Operators carried the well 39 ft. into the Arbuckle to total depth of 5,200 ft. before backing up for completion at this level.

Nearest production ever found in this area was at Judy, 15 miles to the west in Cheyenne County; there, in November 1951, Ben Brach finished a 5-bbl. pumper in the Marmaton at 4,496 ft. after finding pre-Cambrian at 5,140 ft. But production didn't amount to much and the well was abandoned. Last year, an indicated success in Hitchcock County, Nebraska, 30 miles northeast of the Miami well, created quite a stir and set off a hot lease play, but the wildcat was finally abandoned after months of testing.

Better news yet is the discovery at B on the map. Here, Cities Service Oil Co. 1 Warner has been finished for 330 bbl. of oil per day plus 30 per cent water. This Decatur County strike (Section 9-1s-27w) also produces from the Lansing-Kansas City at 3,324-33 ft. and is the second field to be found along the expansive Cambridge arch (Norton field, Norton County, was first). Its importance has been doubly emphasized as this is written by a reported discovery across the Nebraska line in Red Willow County. It was too late for this map, but M. P. Gilbert 1 Barger lies in Section 6-4n-30w, about 45 miles northwest of the Cities Service discovery. It too is on the arch. Operator reportedly recovered 295 ft. of oil and 15 ft. of heavily oil-cut mud on a 2-hour test at 3,835-3,903 ft., believed to be Lansing-Kansas City.

All over the map . . . Southward, in Thomas County, a fourth wildcat (C on map) made news by pumping 363 bbl. of oil, no water, in 28 hours from Cherokee-Pennsylvanian perforations at 4,608-12 ft. Located in Section 30-8s-32w, Bachus Oil Co. et al 1 Kindig lies 3 miles north of Mingo field, a Marmaton-Pennsylvanian producer. It is still testing, pending final completion. Operators carried the hole to 4,718 ft. in Mississippian.

Thirty miles east of the Bachus wildcat, yet another Pennsylvanian pool opener in Heathman-Seeligson Drilling Co. 1 Brown "A," in Section 26-8s-27w, Sheridan County. This one found more Lansing oil at 3,860-3,910 ft., recovering 1,500 ft. of clean oil on test. Other shows were recorded in the Marmaton and Kansas City sections. It is still testing.

Swinging south another 50 miles to Ness County, success scored again at Barnett Oil Co. 1 Ward, a Mississippian discovery in Section 4-19s-26w (D on map). Pumping completion here recorded 5 bbl. of oil per hour natural.

A seventh important discovery was dealt with in this column last week. This one, Helmerich & Payne 4 White, is at E on the map, and is opening Morrow oil production at the 5,000-ft. level beneath the giant Hugoton gas field. It also found oil zones in the Mississippian.

Spell a discovery story . . . These seven strikes spell a discovery story, but they're only the opening chapter. Unfortunately, none of them is what you'd call a major strike, but the collective effect will be felt in future wildcatting and leasing programs. There's plenty of room to play in out there, and it's a pretty safe prediction that the entire embayment will undergo an active drilling spree in the next 2 years. The Rocky Mountain boys are watching the Cambridge arch events with an eagle eye, and if the Red Willow County story proves true, they'll descend on the arch country in droves. This is independent hunting ground, and there's plenty of it, so keep **your** eagle eye on western Kansas if you're of the Mid-Continent set, and on Southwest Nebraska if you're a Rocky Mountaineer.

Well-known Newscaster, WJBK-TV, Detroit

Jac LeGoff asks:

"What happens to the money a business takes in?"

W. J. Hollmann, General Accounting Department, Standard Oil Company, Chicago, Illinois:

"Our company did a whale of a business last year . . . $2,102,308,139. That's what we 'took in' as you say and includes taxes collected from customers for government agencies. At the same time we were spending $1,424,739,000 for materials used, operating and general expenses, and salaries and wages. That's equal to 67.8 per cent of the total we took in. Charges for wear and tear amounted to $139,184,000—6.6 per cent. Federal taxes on income and other taxes, including those we collected from customers for government agencies, amounted to $381,267,000—another 18.1 per cent. These costs and expenses amounted to $1,945,190,000 for Standard Oil and its subsidiaries in 1955. That's more than 92 per cent of what we took in."

P. H. Towle, Research Group Leader, Standard Oil Laboratories, Whiting, Indiana:

"In a business as competitive as ours you can't stand still or you won't stay in business very long. You have to keep on improving your product and your service all the time—and that takes money. The two-octane number increase in gasoline made between July 1, 1954, and July 1, 1955, costs the consolidated company over $10,000,000 each year. And last year alone Standard Oil invested millions of dollars in research to bring our customers more powerful gasolines, all-weather motor oils, and other product improvements."

Cyrus Wright, Payroll and Tabulating, Standard Oil Company, Sugar Creek, Missouri:

"There are more than 50,000 Standard Oilers, so you can imagine the size of our payroll! Our people earned $330,800,000 last year in wages and benefits. Yet, believe it or not, large as our payroll was, we paid out $381,267,000 for taxes of all kinds. That includes our own taxes and the taxes we collected from customers for local, state and national governments."

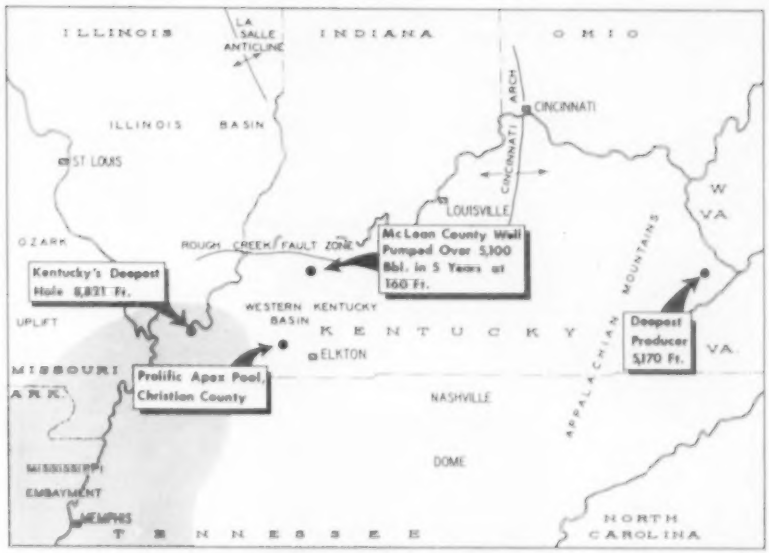
Marvin L. Hayes, Treasurer's Office, Standard Oil Company, Chicago, Illinois:

"Well, it's a small part of the total taken in, but as a return on their investment, a company pays dividends to its share owners. Dividends were paid in 1955 for the 62nd consecutive year. Our last dividend of the 1955 year went to 132,400 owners, many of whom are educational or charitable institutions like Children's Hospital, Detroit (shown above). Dividends amounted to 2.7 cents of each dollar we took in. The rest of what we took in, 4.8 cents per dollar, was retained for use in the business. Including the market value of the special dividend in Standard Oil Company (New Jersey) stock our dividends were equal to about 1/2 of net earnings."

What makes a business a good citizen?

Being open-and-above board, for one thing. That's the American way. Standard Oil Company and its subsidiaries report fully each year to government, shareholders, employees, and the public just what use was made of the money we took in. Copies of our Annual Report for 1955 are available on request as long as the supply lasts. Our address—Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD



KENTUCKY LEADS in 1956 Eastern Interior drilling activity.

Bluegrass Exploration Ranks Tenth

NEW discoveries in 1955 brought the number of counties producing oil and gas in the Commonwealth of Kentucky to 54. Production of oil stands at 15,733,327 bbl., an increase of 1,962,000 over 1954 figures. This production sold for $45,212,048.49. In addition to oil, the Commonwealth produced about 73,000 M.c.f. of gas.

Ranks tenth . . . The State of Kentucky ranks tenth in the nation in exploratory wells drilled . . . 399 in 1955 (53 new oil pools, 12 new gas pools, and 334 dry holes). Exploratory wells included a grand total of 1,592 operations drilled 2,372,000 ft. So far in 1956, Kentucky operators have put down 604 wells compared to 445 at this time last year. There have been 12 new oil pools opened in the state. A total of 148 wildcats have been completed to May 12.

Rim area . . . The greatest activity during 1955 and the first 5 months of 1956 was in the so-called Rim area of the Western Kentucky basin in the counties of Christian, Muhlenberg, Todd, and Hopkins. This interest followed the opening in 1954 of Apex field in northern Christian County.

At the shallow depth of only 700 ft., the Jackson-Mississippian sand proved to be a prolific pay. In some 15 months this pool yielded 575,132 bbl. of oil from 182 wells. As a result, Christian County has earned a place, along with Henderson, Union, Magoffin, Ohio, Daviess, and Webster, as a leading oil county of Kentucky. So far this year, 115 oil wells have been completed in Christian County. Wildcatters have opened three new oil pools in the county.

Deepest hole . . . The year 1956 opened with the completion of the deepest test yet drilled in the state. Shell Oil Co. 1 M. Davis, Crittenden County, reached a total depth of 8,821 ft., but failed to find production. At present the **deepest-producing well** in Kentucky is United Carbon Co. 1 Howe in Pike County, extreme eastern Kentucky. The well produced gas from the Devonian at 5,170 ft.

In contrast to this, the state has many so-called "post hole" producers, a typical example being found in McLean County where J. C. Miller Oil Co. has pumped over 5,100 bbl. of oil in 5 years from its 1 G. W. Hartford at a depth of only 160 ft. This well is still making 3 bbl. per day.

Historical background . . . The foregoing facts concerning the past year's accomplishments in Kentucky indicate the vast importance of oil and gas to the economy of the state; and establishes the industry as one of the foremost in the Commonwealth.

Not many people know that while the Drake well in Pennsylvania in 1859 was the first well drilled where oil was deliberately sought, that in 1819 while drilling in McCreary County, Kentucky, for salt water, oil was accidently discovered. Ten years later the Great American well in 1829, which also sought salt water, was discovered in Cumberland County, Kentucky. It has been estimated that from this latter well over 50,000 bbl. of oil flowed down the Cumberland River for 3 weeks before the well ceased flowing.

In 1829, the only demand was sale of the oil for medicinal purposes at $1.00 per bottle, while the 1956 situation shows an ever increasing demand for both oil and gas.

Kentucky's Geologic Picture*

Kentucky is divided into four distinct structural provinces . . . The Gulf Coast or Mississippi embayment portion of the state in the southwest corner, the Western Kentucky basin, which is separated from the Illinois basin by the Rough Creek fault zone, the Cincinnati arch, which divides the state north-south, and the Eastern Kentucky syncline or Appalachian syncline.

Mississippi embayment . . . The unconformity and subsurface faulting in this portion of Kentucky is quite complicated. Only general conclusions can be made of this region as to its potentialities as an oil and gas-producing province. It is interesting to geologists because so little is known about it.

Western Kentucky basin . . . This syncline includes the Pennsylvanian, Chester-Mississippian, and a large part of the Lower Mississippian rocks of Kentucky. Production comes from Pottsville-Lower Pennsylvanian to the Silurian. Production in the basin is controlled by sand conditions, rather than by structure. The Chester is the leading producing section in the basin.

Cincinnati arch . . . Most of the oil wells on this structure are short lived, coming in for flush production, then dropping off sharply.

The arch is a showcase for geologists. Ordovician beds that are productive in southern Kentucky, Ohio, and Tennessee are studied along this low broad arch.

Eastern Kentucky syncline . . . Productive beds in this eastern section of Kentucky, the Appalachian region, include the Pottsville through the Knox dolomite. The main pay sands here are the Weir, Beaver, Ohio shales, and the "Corniferous."

A rapid wedging takes place throughout this section of the state in the Corniferous. All pools along or near this zone are stratigraphic traps, rather than a result of wedging on the flanks of the Cincinnati arch or other buried highs.

*"Kentucky's Geological Structure," D. J. Jones, National Oil Scouts and Landmen's Association Year Book, 1941.

What's Ahead for Alberta's Southwest Area?

IN the past 18 months, the Mississippian reservoir in the Sundre, Westward Ho, and Harmattan area of Alberta has grown to sizable proportions. Both the Sundre and Westward Ho discoveries highlighted western Canada exploratory news last year. This year, the Harmattan strike promises to be among the top discoveries. It is almost certain that the Sundre-Westward Ho-Harmattan Mississippian reservoir trend will continue southward beyond Harmattan.

Fifteen-year production forecast for Harmattan . . . According to J. C. Sproule & Associates, total reserves in the Harmattan pool are 16,763,400 bbl. The Mississippian production in the field is on 80-acre spacing.

By 1970 there should be 45 producing wells in the field. Estimated daily production per well in the field by then will be 40 bbl. Yearly production of oil in 1970 will be 657,000 bbl. Cumulative production will be 12,509,690 bbl. Estimates of 1956 production in the field are set at 164,700 bbl.

Entire area . . . Total reserves of the Westward Ho, Harmattan, Sundre, and Medin area is estimated at 115,750,000 bbl. Yearly production will be about 6,044,400 bbl. by 1970. This year's total production should be 1,317,600 bbl. By the end of 1956, there will be 58 wells producing in the trend with an estimated 276 by the end of 1970.

Reservoir Data

Westward Ho field:

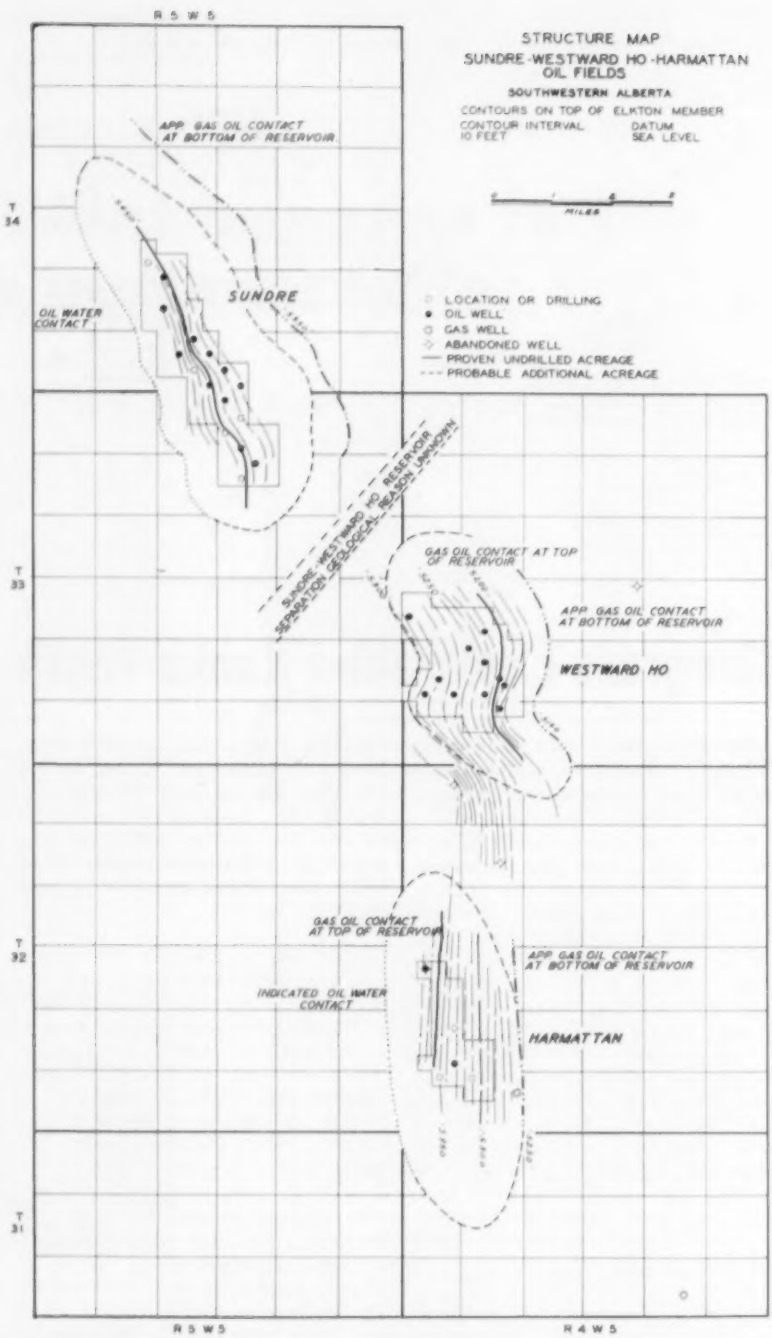
- Producing formation — Elkton (and Shunda?).
- Average pay thickness—44 ft. for proven acreage, 20 ft. for probably additional acreage.
- Average porosity—6 per cent.
- Connate water—15 per cent.
- Shrinking factor—0.68.
- Recovery factor—35 per cent (very fractured).

The Westward Ho reservoir should yield a recoverable reserve of 94 bbl. per acre-foot.

Harmattan field:

- Producing formation — Elkton (and Shunda?).
- Average pay thickness—30 ft.
- Average porosity—12 per cent.
- Connate water—15 per cent.
- Shrinkage factor—0.75.
- Recovery factor—35 per cent.

This field should yield a recoverable reserve of 208 bbl. per acre-foot.



NOTE: This map, as well as all reservoir data in this article, are from a special report made to Pembina Pipeline Co., Ltd., by J. C. Sproule & Associates.

Summary of reserves . . . For the Sundre, Westward Ho, and Harmattan areas, this shows that:

. . . Sundre. Proven developed reserves total 9,984,000 bbl.; proven undeveloped reserves total 19,968,000 bbl.; probable additional reserves total 19,302,400 bbl.; total reserves are 49,254,400 bbl.

. . . Westward Ho. Proven developed reserves total 3,308,800 bbl.; proven undeveloped reserves total 5,459,520 bbl.; probable additional reserves total 6,843,000 bbl.; total reserves 11,611,520 bbl.

. . . Harmattan. Proven developed reserves total 955,400 bbl.; proven undeveloped reserves total 5,241,600 bbl.; probable additional reserves total 10,566,400 bbl.; total 16,763,400 bbl.

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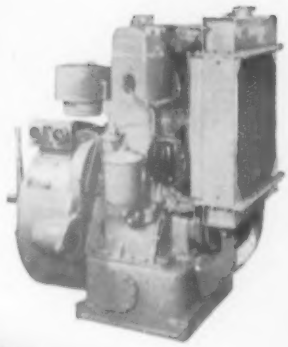

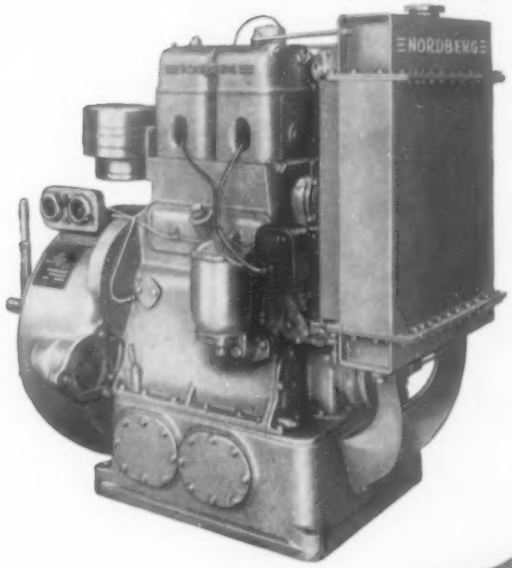

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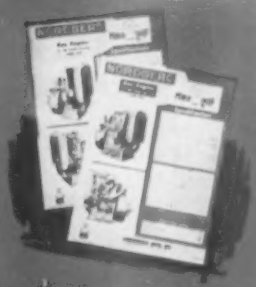

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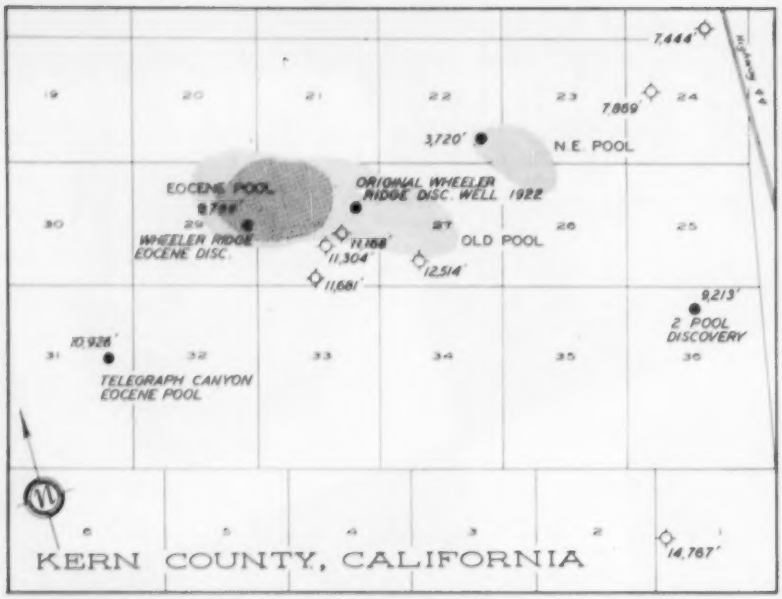

WHEELER RIDGE FIELD has had its most spectacular growth in the past 4 years.

Four New Pools Discovered in 30-Year-Old California Field

by Bill Smith
District Editor

EXPLORATION on the flanks of Wheeler Ridge field in southeast San Joaquin Valley has added four new pools in the past year.

With one exception, all discoveries were east or northeast of the 30-year-old field. More development drilling will be required before their full importance can be determined, but indications are that best prospects for new reserves lie in these directions. Exploration to the south and west largely has been unsuccessful.

At last count, the field's 114 wells were producing from 12 different pools. These included pools in the Santa Margarita, Maicopa, Valv, Olcese, and Vedder of Miocene age; Oligocene formations and Eocene sands.

Rapid growth . . . This southern Kern County field has had its most spectacular growth in the last 4 years. A good indication of the rate of its expansion can be found in the cumulative production figures since its discovery in 1922.

The field has produced as much crude since 1950 as it had in the previous 28 years of its existence. In 1951, the field produced a total of only 272,000 bbl. Four years later, promotion had jumped to where the 1955 yield was in excess of 2,391,000 bbl.—almost 10 times as much as in 1951.

Early history . . . The field, which is located 25 miles south of the city of Bakersfield, first attracted the attention of geologists in 1910 because it was an obvious surface anticline.

Several dry holes were drilled between 1914 and 1922. In 1922, Standard Oil Co. of California completed 2 Kern County Land (see "A" on map) for the field discovery. This early wildcat was brought in for 275 bbl. daily of 25.5°-gravity crude from 2,875 ft. By 1928 this shallow zone, which consists of two zones of upper Miocene age, was completely developed with 35 producing wells. The two zones were the Santa Margarita (at 2,000-2,500 ft.) and the Maricopa (3,200-4,000 ft.).

Between 1928 and 1952, when a major Eocene discovery was scored by Richfield Oil Corp., production in the main area of the field had dwindled to about 700 bbl. daily. Richfield's find spurred drilling activity there to the extent that the field is now producing an average of 7,200 bbl. daily.

Geology . . . The field presents an encouraging surface appearance. It is an asymmetric anticline that trends in a westward direction with the axial plane dipping southward. Formation dips on the north flank average 50°, with some as high as 70° and 80°. South-flank dips generally average 20°.

The field itself consists of the following: (1) a big surface anticline which is terminated downward (northwest) by the Wheeler Ridge thrust fault; (2) a moderate hanging-wall anticline which is steeply overturned on the north flank; and (3) a foot-wall anticline. This latter anticline is probably a relatively larger and less disturbed feature.

Oil in the foot-wall anticline accumulated considerably below the present depth. This is indicated by the pressures, which are abnormally strong for the depths involved.

Aside from the pressures encountered in certain zones, drilling operations are routine. But getting a drill site prepared for the rig often presents major problems. The terrain is mountainous so access roads are expensive to build and maintain. Moving drilling equipment to the site is a hazardous operation in many cases.

Recent history . . . Richfield's 1952 Eocene discovery followed three significant dry holes drilled by Richfield and Hancock Oil Co. These were 11,000-ft. tests drilled in Sections 28 and 35 of 11n-20w.

On the basis of geologic evidence gained from those dusters, Richfield drilled 85-29 KCL D in SE NE 29-11n-20w in 1952 (see B on map). En route to total depth of 9,765 ft., it encountered good shows in the Vedder (found at about 5,700 ft.) and the Refugian (at 9,400 ft.).

The well was completed in the Eocene at 9,600-9,765 ft. for more than 1,000 bbl. daily of 35.3°-gravity crude.

After Richfield's Eocene discovery, which was on the west flank of the old producing area, Standard drilled two unsuccessful Eocene tests ¾ and 1½ miles east of 85-29 KCL D.

Richfield moved west and south in its initial efforts to extend the deeper production. Between 1952 and 1955, it drilled 10 deep wildcats which resulted in one additional Eocene discovery. The successful wildcat was the 10,926-ft. 84-31 KCL D, which opened Telegraph Canyon pool in August 1955. (See C on map.)

Richfield drilled five dry holes in 1953, three in 1954 and one in 1955 in the Eocene search. The 1953 tests included the following: a 14,238-ft. test

3 miles west of the Eocene discovery; a 12,307-ft. hole 3 miles southwest; an 11,600-ft. duster 5½ miles southwest; a 10,074-ft. dry hole 5 miles west; and a 9,030-ft. wildcat 6 miles west.

In 1954, the program included a 10,627-ft. dry hole ¾ mile southeast, a 9,967-ft. test 4 miles west, and a 14,767-ft. wildcat 5 miles southeast.

Two months prior to the Telegraph Canyon discovery in 1955, Richfield drilled an 11,938-ft. duster 1¾ miles southwest of Wheeler Ridge production and ½ mile southwest of Telegraph Canyon.

Eocene production, which appears to be confined to about 500 acres in the discovery area, leveled off last year. In February 1955, 17 Eocene wells produced 4,249 bbl. daily. In February 1956, 23 wells in the same pool produced 4,767 bbl. daily. Telegraph Canyon Eocene production was only 20 bbl. daily from two wells last February.

In addition to the Eocene discoveries, Richfield conducted a successful search for shallower pay at the same time. Since the original Eocene discovery, the operator chalked up finds in seven new pools in six different zones.

Most of these pool discoveries occurred as the result of deeper drilling within the limits of the old area or immediately adjacent to it. However, three finds were made at enough distance from the main area to warrant mention.

The Northeast pool, a Miocene discovery of last year, is located ¾ mile northeast of the old area. (See D on map.) The recent "Z" pool in the Windgap area is located 2 miles southeast of the main area. And the previously mentioned Telegraph Canyon Eocene pool is 1½ miles southwest of the old area.

Newest discovery . . . The recent "Z"-pool discovery has generated much interest, both because of its distance from the main producing area and the fact that several other companies have adjoining acreage. (See E on map.)

Early in March, the operator successfully completed the 9,213-ft. wildcat as a lower Miocene discovery. The producing formation is a Vedder equivalent of the Zamorian stage of lower Miocene. Intial production from the perforated interval (8,948-9,042 ft.) was 150 bbl. daily of 41.5°-gravity crude.

Current activity . . . At the present time, Richfield has four strings drilling in the field. One of these was drilling below 9,453 ft. on the first offset to the "Z" pool discovery. The other was redrilling below 9,498 ft. on a site on the north flank of the main area.

The operator recently abandoned a closely watched wildcat located in Section 13, more than 4 miles from the main producing area. This test was taken to 7,444 ft. before Richfield gave up after failing to encounter any encouraging shows. (See F on map.)

EXPLORATION HIGHLIGHTS

APPALACHIAN

EASTERN KENTUCKY

In Breathitt County, United Fuel Gas Co. of Charleston, W. Va., have staked location for a rank wildcat test. Same will be known as 1 Downing and will be located 1,600 ft. west of latitude 83 degrees 15 minutes and 3,000 ft. south of longitude 37 degrees 30 minutes. This is approximately 7 miles southeast of Jackson, the county seat.

OHIO

Natol Corp. opened up a productive area north of Gratiot with a combination well gaging 1,350,000 cu. ft. gas and 20 bbl. oil in a 24-hour period after frac. On 1 R. W. Rambo, Section 21, Hopewell Township, Licking County, Clinton was logged at 3,104-56 ft. with 500,000 cu. ft. natural. In the same township, the Clinton Oil 3 E. Husband, on an outside location in Section 8, gaged 265 bbl. in a 24-hour test from Clinton 3,011-49 ft.

● Midland Oil's second well on C. L. Hupp, Section 14, Bowling Green Township, Licking County, gaged 2,000,000 cu. ft. gas with 60 bbl. in a 24-hour test 60 days after fracture. Clinton sand was found at 2,873-2,935 ft. with a fair showing natural.

● Pure Oil Co. 4 L. M. Shaw, Lot 13, Licking Township, Muskingum County, an extension to Nashport pool, gaged 165 bbl. from Clinton at 3,281-3,338 ft.

PENNSYLVANIA

In Gaskill Township, Jefferson County, Southwest Pennsylvania, Columbian Carbon Co. is moving in at 1835 Frank M. Sheesley, wildcat, Punxsutawney Quadrangle, 5.20 miles south of latitude 41 degrees 00 minutes, 0.49 mile west of longitude 78 degrees 50 minutes. This company's 1834 Harriett McClure is drilling at 4,990 ft.

● Mount Pleasant Township, Westmoreland County, Peoples Natural Gas Co. 4092 J. G. Mailey is at 250 ft.

WEST VIRGINIA

Dry Fork district, Randolph County, West Virginia, Hope Natural Gas Co. has announced another wildcat to be drilled on lands of U.S.A. Department of the Interior. The aerial number is 10000 and is on the Spruce Knob Quadrangle 1.8 miles south of latitude 38 degrees 45 minutes and 3.8 miles west of longitude 79 degrees 40 minutes. Nelson W. Taylor, in 1 H. R. Tingler, recorded the top of the lime at 4,550 ft., and is drilling at 4,560 ft.

● Plymouth district, Mercer County, United Fuel Gas Co. 8425 S. L. Bailey, elevation 2,472 ft., reached the Maxon sand at 1,488 ft., and had gas at 1,539 ft., gaging 400,000 cu. ft. At 1,552 ft. it increased to 1,852,000 cu. ft. and shut down to run a string of 5½-in. casing.

HUGOTON EMBAYMENT

TEXAS PANHANDLE

Two Gas Fields Opened in Panhandles

Two new gas fields in the Panhandle area of Oklahoma and Texas have been opened by Stanolind Oil & Gas Co.

Stanolind B-1 Lips Ranch, located in the northwest corner of Roberts County, Texas, has been completed for 15,000 M.c.f. of gas daily on open flow. Production is from the Morrow sand through perforations from 8,494 to 8,526 ft. The Morrow was topped at 8,470 ft. The well was drilled to a total depth of 9,455 ft. and plugged to 8,536 ft. Sand fracturing treatment opened the zone to production.

Stanolind has full interest in 50,692 acres. The well is located in Section 31, Block A, H&GN Survey, Roberts County.

● Stanolind 1 Campbell, in Beaver

Exploration This Week

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County, Oklahoma, tested for 11,396,000 cu. ft. of gas daily from the upper Morrow sand, which was topped at 7,242 ft. Test was through perforations from 7,252 to 7,256 ft., and 7,260 to 7,272 ft. Total depth of 1 Campbell was 7,800 ft., plugged back to 7,622 ft.

The well is located in 5-2n-24eCM, Beaver County. Stanolind has a full interest in 2,080 acres.

NORTHWEST OKLAHOMA

Big Gas Flow Reported At McClung Discovery

A Tonkawa-Pennsylvanian gas discovery in the Laverne district of Harper County reported a gas flow of 81,800 M.c.f. per day on 20-minute test. Cities Service Oil Co. 1 McClung "A," NW NW SE 11-26n-25w, showed initially for 32,000 M.c.f. per day following fracture of perforations at 5,455-70 ft. The well was then shut in for 8 hours, making 65,300 M.c.f. per day. Another test made 89,000 M.c.f. per day in 5 minutes, the flow then declining to 81,800 M.c.f. per day in 20 minutes.

The well is also a Chester-Mississippian discovery and tests are due in the zone at 6,945-66 ft. The well will then be dually completed.

Gulf well . . . Gulf Oil Corp. 1 Laverne State in SE NW 13-26n-25w, Harper County, recovered fluid at the rate of 176 bbl. load oil, 8 bbl. new oil and 97 bbl. water with 5,200 M.c.f. of gas per day on ½-in. choke on preliminary tests of the Morrow sand at 6,972-7,018 and 6,942-62 ft. This well is also a Hoover sand discovery at 4,270-4,326 ft. From that zone the well flowed 4,100 M.c.f. of gas per day.

Another Gulf well in the Northeast Laverne field area, the 1 McClung, SE SE NW 23-26n-25w, flowed 3,170 M.c.f. of gas per day from the Morrow sand at 6,922-32 and 6,950-7,000 ft. It also flowed 3,880 M.c.f. per day from the Hoover-Pennsylvanian sand at 4,160-4,210 ft.

Hoover Tested at East Laverne Discovery

Sun Oil Co. is testing the Hoover sand at its 1 Carlisle, discovery well of East Laverne field, Harper County.

The well flowed 1,500-2,000 M.c.f. of gas per day from 4,152-80 ft. in the Hoover-Pennsylvanian sand. The zone will be fractured in an effort to increase production. The well is in C SW NE 25-26n-25w. The south offset to this discovery is the 1 Carlisle-B, C SW NE 31-26n-24w. Work is under way.

Here Are the Tops of Important Harper Test

Geological tops of an important Harper County wildcat, Wilcox Oil Co. and Eason Oil Co. 1 Hovey estate, C SE NW 8-25n-23w, have been released.

The operators, drilling on a farmout from Oklahoma Natural Gas Co., are drilling below 6,603 ft. in the Cherokee-Pennsylvanian. The Panhandle dolomite was topped at 3,015 ft.; Virgil 4,085 ft., Hoover 4,298 ft. and sand at 4,353 ft.; Elgin 5,021 ft.; Oread 5,155 ft.; Tonkawa sand 5,359 ft.; fossiliferous porous lime with gas show at 5,484 ft.; Checkerboard lime 6,057 ft.; Oswego lime 6,439 ft. with gas show at 6,464 ft.

Interest in this important wildcat southeast of the Laverne district discoveries in high. There have been reports of a thick Hoover sand section in the well. No formation thicknesses have been released.

OKLAHOMA PANHANDLE

Open Flow Rate Reported At Grand Valley Gasser

Calculated open gas flow was reported at Carter Oil Co.'s 1 Reuszer,

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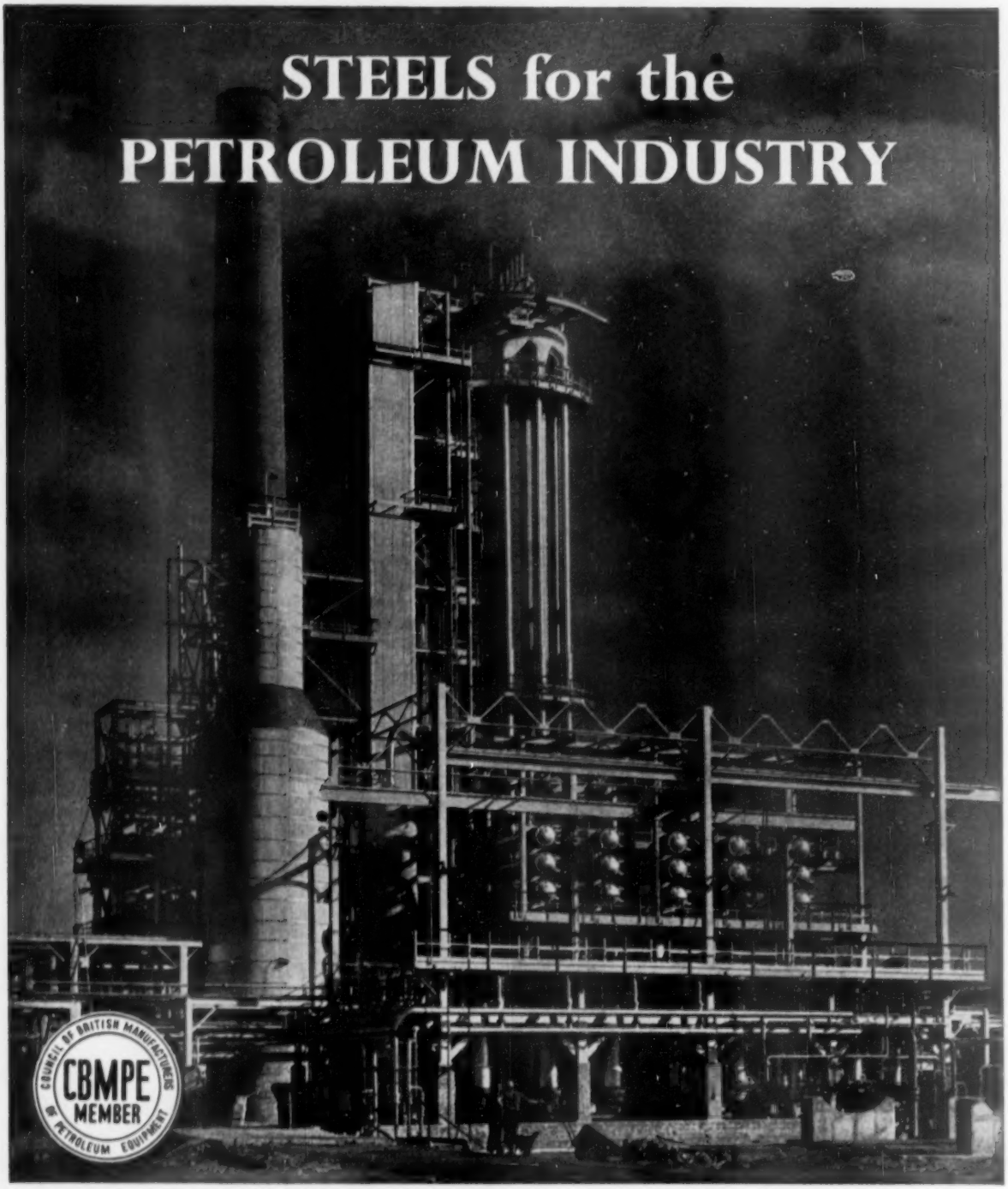

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SE SE NW 3-1n-19eCM, Grand Valley field, Texas County. The well had a flow of 76,000 M.c.f. of gas per day from 27 ft. net pay in the Morrow sand at 6,666-94 ft. on ½-in. choke.

North Richland Center Extended 1 Mile North

North Richland Center field, inside Hugoton gas field, has been extended 1 mile north by Panhandle Eastern Pipe Line Co. The 1 Drosselmyer, C NE SW 33-6n-12eCM, Texas County, flowed 2,632 M.c.f. of gas per day on test of the Morrow at 5,878-5,924 ft.

New Map

Heydrick Mapping Co., Box 448, Wichita Falls, Tex., has available a new map of the six counties in the northeastern portion of the Texas Panhandle. The map covers Hansford, Ochiltree, Lipscomb, Hutchinson, Roberts, and Hemphill, all important pre-Permian areas in the Hugoton embayment.

This map is up-to-date, showing leases, expiration dates, fee owners, and all drilling wells, locations, and dry holes. Scale is 1 in. equals 8,000 ft. Size is 42 by 63.

SOUTH TEXAS

GULF COAST

New Vicksburg Reservoir Produces at Blue Ridge

A new Vicksburg reservoir is being opened off the east flank of the old Blue Ridge salt dome in the northeastern corner of Fort Bend County, southwest of Houston.

Discovery well, 1 Dillard, drilled by Christie, Mitchell & Mitchell, is about ½ mile east of some old shallow-sand wells, nearest production on the dome. It is about 2 miles southwest of Almeda.

The Vicksburg pay is perforated at 7,880-90 ft. in hole drilled and cased to 7,982 ft. Flow through 5/32-in. choke was at the rate of 350 bbl. of 41°-gravity oil daily with gas-oil ratio of 750 cu. ft. per barrel, and pressure of 1,250 psi.

New Deeper Pay Extends Rock Island Production

Production at Rock Island, in western Colorado County, is being extended a mile southwest by a new Wilcox gas-condensate well completed by The Texas Co.

Pay zone of the new discovery well, 1 Hollis Massey, is perforated at 9,185-99 ft., 600 to 700 ft. deeper than previous deepest Wilcox production (8,500-ft. sand) in the field. Hole was drilled to 9,300 ft. and plugged back to 9,246 ft.

Tested through ⅛-in. choke, the well flowed 866,000 cu. ft. of gas per day with an estimated 50 bbl. of 54°-gravity condensate per 1,000,000 cu. ft. Pressure was 2,500 psi., flowing, and 3,000 psi. shut-in.

Two Oil Zones Produce In San Patricio Wildcat

Seaboard Oil Co. is making a duel completion in its 1-A R. H. Welder Estate, a wildcat, 6 miles northeast of Sinton, in northeastern San Patricio County, near the Refugio County line. The location is in an entirely new area, about 10 miles from nearest other production.

The indicated discovery well was drilled to 7,450 ft. and has casing at 6,460 ft. Pipe is perforated in two Frio sands, the lower at 6,378-82 ft. and the other at 5,932-36 ft. and 5,947-52 ft.

A preliminary drill-stem test, open 12 hours, of the lower perforations got an oil flow estimated at 110 bbl. per day and recovered 90 ft. of clean

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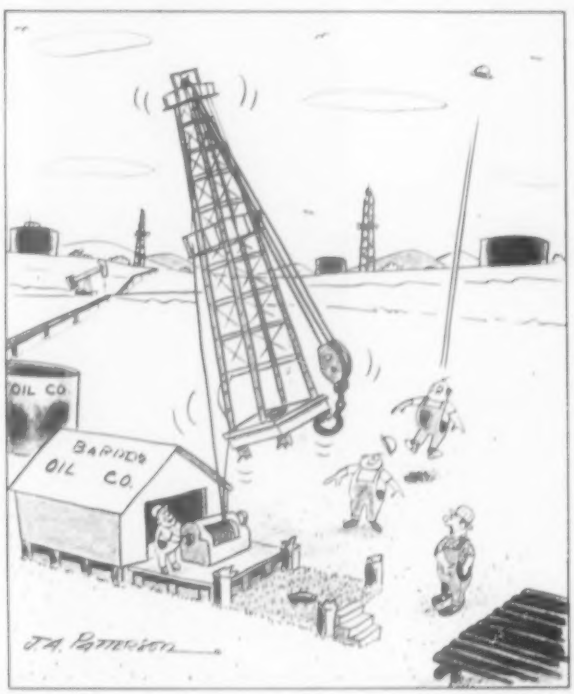


"Okay, okay. You win th' beer—I didn't think it could be done."

oil in the break-down. Test was through ¼-in. and ⅛-in. chokes. In a 24-hour test of the upper zones, flow was estimated at 112 bbl. per day, and recovery 90 ft. of 33.7°-gravity oil.

Kain Offshore Area Gets Two Additional Gas Sands

Shell Oil Co.'s third well in its offshore-located southeast extension area of Kain field, Matagorda County, is opening two additional shallow, Miocene gas-sands, giving the area five known gas-productive sands to date.

The additional sands are in Shell's 1 State Tract 487. The shallower, perforated at 3,674-86 ft., is estimated good for 21,000,000 cu. ft. per day, open flow. The other, perforated at 4,274-90 ft., has an estimated open-flow capacity of 14,500,000 cu. ft. per day.

Shell's extension discovery well, completed in December 1954, is gas-productive from perforated interval at 5,189-5,208 ft. Its second well, completed last March, is productive at 4,000-10 ft. and 4,370-80 ft.

The three wells are in the Gulf of Mexico, just off Matagorda Peninsula. They are 6,900 ft. from other wells located on the Matagorda Bay side of the peninsula. The latter produce gas and condensate from deeper sands.

SOUTH LOUISIANA

Acadia Parish Gets New Gas-Condensate Discovery

Another gas-condensate area is assured for Acadia Parish. Location is 1½ miles south of Crowley and west of Crowley field. Discovery is by Dillard & Waltermire, Inc., of Houston, at their 1 Bourdreaux.

The well, drilled to 15,025 ft. and cased to 14,076 ft., is productive from a casing-perforated interval at 13,936-45 ft. Completion gage, with flow through ⅛-in. choke, was 68 bbl. of 49.2°-gravity fluid and 3,216,000 cu. ft. of gas per day. Flowing pressure was 10,200 psi.

Lake Washington Area To Get New Deep Test

Richardson & Bass, who, with John W. Mecom and others, recently completed the world's deepest well, located 5 miles northeast of Lake Washington field, in Plaquemines Parish's Mississippi River delta marshland, will drill another ultra-deep test in the same general area.

They are going back into an old hole, drilled in 1954 to 11,810 ft. and will carry it down to a depth below 20,000 ft.

Its location, 1 Humble-R. F. Price and others, is about 3 miles southeast of the record-depth well. The latter was drilled to 22,570 ft., and produces from a lower Miocene sand, perforated at 21,419-35 ft. and 21,443-65 ft.

SOUTHEASTERN STATES

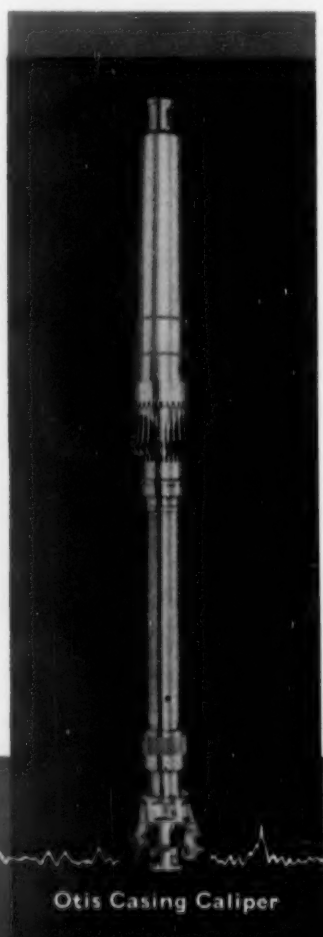
MISSISSIPPI

Jefferson County Gets New Wilcox Discovery

Jett Drilling Co., of Shreveport, has completed its 1 Wagner, a mile north of Fayette field, in Jefferson County, southwestern Mississippi, as a new-field oil-discovery well. It opens North Fayette field.

On the pump for potential gage, the well produced 60 bbl. of 39°-gravity oil per day without any water. Its pay, in Wilcox sand is perforated at 3,918-21 ft. The pay is believed to correlate with the Wilcox (4,600-ft.) sand in farther down-dip fields.

Two good-looking gas sands were logged above the oil zone.


Otis Casing Caliper

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PRESSURE CONTROL OTIS SERVICE - EQUIPMENT

San Juan Basin

Left photo. Cores are from Sunray's first oil well in San Juan basin, 1 Federal "B," San Juan County, New Mexico. Right photo. Sunray 1 Federal "B." IPF 720 bbl. oil per day. Well is ¼-mile extension of East Bisti field.

OTIS CALIPERS

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Don't risk the consequences of internal corrosion damage. If you are operating gas and/or oil wells in corrosive areas, you need accurate, reliable information on the *internal* condition of the pipe to determine the exact extent of any corrosion damage. Otis crews have available a complete set of calipering instruments to survey all standard sizes of tubing and casing — from 1¼" to 8⅝". Tubing can be surveyed for corrosion, rod wear, mill defects, and mashed or crooked joints *in the hole, under pressure, without killing the well or disturbing packer settings.* Otis crews can also make casing corrosion surveys in the hole, in a single run, at appreciable savings in rig time.

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MID-CONTINENT

OKLAHOMA

Good Bromide Discovery Completed in McClain

McClain County in south-central Oklahoma has a new Hunton lime and Bromide sand oil pool, 6 miles south of Washington field. The discovery well is Gulf Oil Corp.'s wildcat, the 1 Dyer in SE SW NE 20-6n-3w.

The well flowed 748 bbl. of oil in 12 hours on ½-in. choke from perforations in the Bromide sand at 10,100-200 ft. From the Hunton lime at 8,955-97 ft. the well flowed more than 600 bbl. per day; 336 bbl. per day on ½-in. choke.

New Cherokee Trend Discovery Completing

A Red Fork sand discovery in Grant County's Cherokee trend is being completed by Seneca Oil Co. The discovery well, 1 Lewis in C SW NW 26-28n-7w, flowed 85 bbl. of oil and 1,026 M.c.f. of gas per day through 14/64-in. choke from perforations at 4,889-88 ft. Gas-oil ratio is 11,958:1.

Oil Fields and Highways of Oklahoma

Vance Rowe Reports of Tulsa has just published a complete set of maps covering the State of Oklahoma. These maps show all oil fields in each district and the principal roads servicing the areas. The state is broken down into 11 producing districts and individual maps or the complete set can be purchased.

NORTHWEST KANSAS

Testing Under Way at Rawlins County Strike

Testing continues at the Rawlins County discovery prospect, Miami Operating Co. 1 Brumm "A," NE SE SW 7-2s-36w, 43 miles northwest of nearest production.

The Lansing-Pennsylvanian discovery swabbed 2 bbl. of oil per hour from perforations at 4,410-18 ft. This will be the first producer in the county. Closest oil is at Pollnow pool in Decatur County. Location is off the southwest flank of the Cambridge arch in remote wildcat territory.

Thomas County . . . Bachus Oil Co. and Veeder Supply Co. are installing pump at the 1 Kendig in NE NE SE 30-8s-32w, 5½ miles north of Mingo pool, after swabbing 360 bbl. of oil in 18 hours from the Cherokee-Pennsylvanian at 4,608-12 ft.

NORTH TEXAS

Old Well Is New Pay Opener in Wise County

The Barrow field just south of the town of Chico in northwestern Wise County gained a new pay at an old well drilled deeper. W. D. Barrow 1 Jennings, W. Hersee Survey, A-410, was a depleted Strawn sand producer at 4,502-25 ft. Operators drilled ahead to 5,666 ft. and recompleted from perforations at 5,652-66 ft. in a conglomerate section. Potential was 169.36 bbl. of 43.8° oil a day through 18/64-in. choke. Flowing tubing pressure was 225 psi. and gas-oil ratio was 910:1.

High Potential at Throckmorton Discovery

Tennessee Gas Transmission Co. 1 Beulah Liles, 3 miles southeast of Throckmorton in Section 292, BBB&C Survey, A-976, Throckmorton County, flowed 138.36 bbl. of oil in 6 hours, to rate a daily potential of over 553 bbl. Flow was through 30/64-in. choke, with tubing pressure of 90 psi. and gas-oil ratio 200:1.

Pay section was the Caddo around 4,246-58 ft. Top of the Caddo was 4,242 ft.

Taylor County . . . Burton-Price Industries, Inc., Dallas, reported a flowing Cross Cut sand discovery, or long extension southwest of the Shaffer pool. Their 1 H. T. Webb, 5 miles northwest of Bradshaw in William Clifton Survey, flowed 408 bbl. of 41° oil a day on 16/64-in. choke, from pay perforations at 4,272-80 ft. Tubing pressure was 200 psi. and gas-oil ratio 200:1. Top of pay was 4,272 ft. on elevation of 2,056 ft.

Operator has requested the new field name of Webb-Cross Cut, since nearest similar production is 1½ miles to the northeast in Shaffter pool.

Clay County . . . Jack Grace Production Co. 1 Plaxco, 5 miles north of Bellevue and 1½ miles south of Hapgood field, in Clay County, has been completed as a discovery in the conglomerate.

Daily potential was 152 bbl. of 43° oil through 20/64-in. choke from perforations at 6,319-27 ft. Tubing pressure was 125 psi. and gas-oil ratio was 1,600:1. Location is in Section 4, T&NO Survey, A-885.

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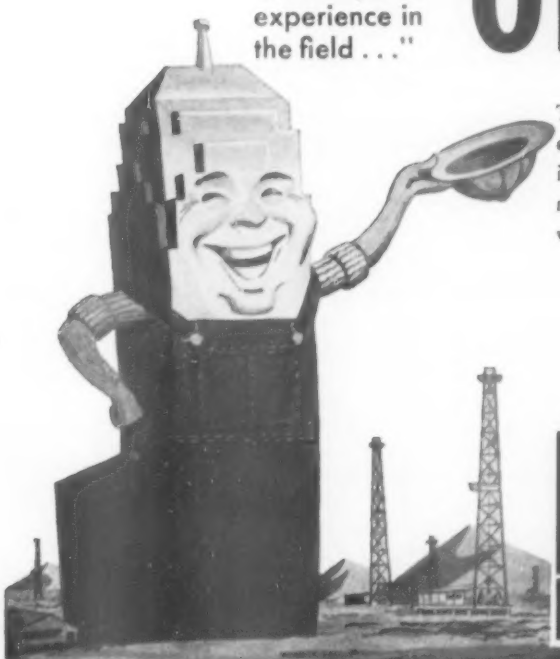

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WEST TEXAS-NEW MEXICO

New West Texas Map

Midland Map Co., 412 N. Big Spring, Midland, has issued a new lease ownership and well development map, that shows the Headlee-Dora Roberts trend of fields in both Midland and Ector counties. Size is 42 in. sq. and scale is approximately 1¼ in. per mile.

The area covered is approximately half of both Midland and Ector counties, extending to the north and south county borders, but dividing each county midway running east and west.

Data include sections and surveys, completed and drilling well information that is posted daily; lease ownership, field names, plus towns and principal highways.

WEST TEXAS

Runnels King Sand Strike Flows 500 BOPD

Northwestern Runnels County gained another good King sand strike, or possible northwest extension to the Fennell field, at E. P. Thomas 1 J. O. Smith. The new well is 1½ miles from production in the multipay Fennell area, but separated by a dry hole.

Potential of 500 bbl. a day was based on a flow of 83.4 bbl. of 43° oil in 4 hours through 24/64-in. choke. Pay was topped at 3,000 ft., on elevation of 1,967 ft., and perforated at 3,000-06 ft. Location of the well is in Section 401, B. M. Walker Survey, 5 miles west of Winters.

Depleted Field Opener Is New Pay Discovery

Gulf Oil Corp. 1-L Scharbauer, opener of Ruth Scharbauer field 4 miles north of Midland, has been recompleted as a Pennsylvanian discovery. The well was an Ellenburger discovery in April 1955.

Operators reentered the well and picked top of Pennsylvanian pay at 10,415 ft. Perforations at 10,414-95 ft. yielded 336 bbl. of 58° oil a day with gas-oil ratio of 7,441:1.

Stanolind Gaines County Well Completed

Stanolind Oil & Gas Co. has completed its 1-E Oil Development Co. as a Strawn discovery. Location is in Section 209, Block G, WTRR Survey, 7 miles southwest of Seagraves in Gaines County.

Potential was 235 bbl. of oil a day through 19/64-in. choke, from perforations at 11,243-66 ft.

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If you are the man we want, your record and current position in the petroleum industry will clearly indicate your ability to step into this top position. Whereas knowledge of petroleum distribution at the retail level in the southwestern states is not essential, it will be regarded an asset.

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To arrange an interview in confidence, address American Petrofina, Incorporated, attention Executive Vice President, 10 Rockefeller Plaza, New York 20, N. Y., outlining your work history in detail, and mark "Confidential". Your indication of interest will be held in strict confidence and we will contact no one without your specific permission.

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ARK-LA-TEX

EAST TEXAS

West Slocum Field Gains Third Well

West Slocum field, currently the most active of the Slocum fields in southern Anderson County with 7 rigs running and 1 waiting on potential, gained its third oil well. Magnolia Petroleum Co. 1 A. L. Killion, W. R. Wilson Survey, was completed for 93 bbl. of oil a day.

Completion potential was on the pump. Gas-oil ratio was 905:1, gravity was 44.6° and there was considerable water with the oil.

GREAT LAKES

MICHIGAN

Robert Bond extended Reynolds Dundee-Reed City zone oil pool, Montcalm County, over ½ mile further to the southeast with successful completion assured at the 1 Crimmins, SE NW NW 18-12n-9w, Winfield Township. Well flowed 40 bbl. of oil in 40 minutes from pay drilled between 3,330-32 ft. after being shut in overnight. Well was scheduled to be tubed before further production tests were run, but it appeared certain that this extender would produce Reynolds field daily well allowable (75 bbl.) natural.

• R. H. Wolcott cored, and may sand fracture, a Michigan Stray sand oil pay at the 1 Walter, NW SW SW 24-17n-4w, Grant Township wildcat, Clare County. About 10 ft. of what appeared to be broken but effective pay showed in a 25 ft. core cut between 1,346-71 ft. Wildcat is located about 1 mile northwest of Clare City Stray oil pool where three small wells, out of six original oil wells, are still being produced.

This is second oil-showing Stray well in Michigan to be cored. It will be the first oil-showing Stray well to be sand fractured. Because of the pioneering nature of this sand fracturing operation here, this wildcat will be closely watched by the Michigan oil industry.

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BASIN AND RANGE

NEVADA

Richfield Oil Corp. has released the rig on 1 Rabbit Creek, the wildcat Richfield was drilling south of Elko on a farmout from Gulf Oil Co. The operator took this well to 7,349 ft. before preparing to abandon it. The test failed to produce any promising shows.

WESTERN CANADA

SASKATCHEWAN

Breeze Area Wildcat Promises Mississippian Oil

Sun Oil Co.'s 13-7 A. Breeze wildcat in the Lampman area of southeast Saskatchewan yielded oil encouragement in both the Charles and Mission Canyon zones of the Mississippian during recent drill-stem tests conducted at it. Drilling crew on the well carried it to a total depth of 4,700 ft. and has set production casing and production test operations are scheduled to be carried out immediately.

A. Breeze No. 13-7, on LSD 13, 7-5-5w2, is located 1¼ miles east-southeast of Lampman oil field, and 4 miles north of the most northerly oil well in Steelman oil field. No dry holes have been drilled between these two producing areas that lie from 20 to 28 miles north of the United States border, 55 miles west of the Manitoba border and a like number of miles southeast of Weyburn town.

• Mobil Oil of Canada, Ltd., has discovered oil in the upper Shaunavon zone at its current driller in the Midway area of southwest Saskatchewan and during two successive tests run over an 18-ft. interval in that zone clean oil and oil-cut mud, no water, was recovered when drill-pipe was pulled.

The well, Mobil-Woodley-Southern-

N.E. 20-16 Midway, on LSD 16, 20-16-19w3, is about 7 miles northwest of production in North Premier oil field.

PACIFIC COAST

CALIFORNIA

Texaco Hits New Honor Rancho Pool

The Texas Co. extended production in Honor Rancho field, Los Angeles County, ¾ mile southeastward with completion of 13 Honor Rancho A for a new pool discovery. This wildcat was brought in flowing 1,065 bbl. daily of 37.7°-gravity crude from the interval 8,900-50 ft. Previous to this discovery, Honor Rancho's deepest producing well was approximately 6,600 ft. The formation is Miocene age. The well is located NE NW 8-4n-16w.

Complete Second Well At Redondo Beach

Signal Oil & Gas Co. completed the second tideland well at Redondo Beach for 127 bbl. daily. The producing interval of this well, which was directionally drilled from an onshore site, was found at about 3,500 ft. It was plugged back from total depth of 4,690 ft. Signal, acting as operator for itself and two other oil companies, was drilling ahead below 500 ft. on the third of the projected six wells to be drilled from the onshore site.

ROCKY MOUNTAIN

WESTERN NEBRASKA

Discovery Reported at Rank Red Willow Test

There were unofficial reports of success at a rank wildcat in Red Willow County on the Cambridge arch. The indicated discovery prospect is M. P. Gilbert's 1 Barger in NW NW SE 6-4n-30w. Recovery on drill-stem test at 3,835-3,903 ft. in the Pennsylvanian, probably Lansing-Kansas City, was 295 ft. of oil and 15 ft. heavily oil-cut mud.

UTAH

Gage Reported at San Arroyo Discovery

Sinclair Oil & Gas Co. has a new Dakota sand gas discovery at its 2 San Arroyo Unit in SE SE NW 22-16s-25e, Grant County.

The well flowed at the rate of 11,000

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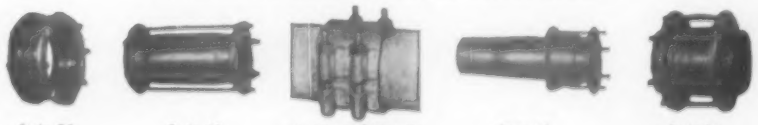

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M.c.f. per day from 5,936-60 ft. Location is 1½ miles northwest of San Arroyo field's discovery well, the 1 Government, which was completed for 18,500 M.c.f. of gas per day from the Entrada last year.

COLORADO

Gas Discovery Rumored In Rio Blanco County

A rumored gas discovery in Rio Blanco County, 2 miles west of Piceance Creek field, flowed more than 8,000 M.c.f. per day. The well is Equity Oil Co. 1 Sulfur Creek-Government, NW NW SW 24-2s-98w. Information is not available as to tops or pay zone.

MONTANA

Daniels Discovery Shut In for Storage

The California Co. has a discovery in the Northeast Bredette area of Daniels County. The well, 1 Paulson, C NW SW 34-33n-49e, flowed at the rate of 8 bbl. per hour on 9/64-in. choke from the Charles C zone (Mississippian) at 6,746-50 ft.

Location is 2½ miles north of Bredette field, a 1955 California Co. discovery. There are four producing wells at Bredette, also a Charles producer. This is the first production for Daniels County.

First production is indicated for Daniels County in the Williston basin portion of Montana. The indicated discovery well is The California Co. 1 Paulson, 1½ miles north of Bredette field. The discovery's pay zone is the Charles-Mississippian.

N.O.S.L.A. Convention Coming June 14

Wiley Wiggins, president of the National Oil Scouts and Landmen's Association, announced that plans are complete for the national convention of the association which this year is being held in Corpus Christi.

Guest speakers for the convention, which begins June 14, are prominent men in the oil industry.

Paul Lyons will speak on "The Trend in Exploration." Lyons is chief geophysicist for Sinclair Oil & Gas Co. Rex G. Baker, vice president and director of Humble Oil & Refining Co., will speak on "The Plight of the Producers of Natural Gas." Miller W. Conn, manager of the market development division of Phillips Petroleum Co.'s research and development department, will speak on "Petrochemicals."

Paul Weaver, former vice president and manager of the geophysical department of Gulf Oil Corp., has selected the subject "Salt Domes." James C. Storm, executive vice president of C. G. Glasscock-Tidelands Oil Co., will talk on "Offshore Drilling."

Wiggins said that the convention chairman, Garland Moody, is expecting 1,000 members and guests to hear the guest speakers. Officers of the association are elected each year at the general convention.

The association is composed of oil scouts and landmen who have consolidated 39 district associations into a national organization. Chief purpose of

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the national association is publication of a 1,200-page annual year book entitled "Oil and Gas Development in the United States and Canada." Volume 26 will be published this September.

Successful Wildcats

ILLINOIS

Douglas County: M. H. Richardson 1 Taylor, NE 3-15n-7e. IPP 40 BOPD, Rosiclare 1,652-64 ft., 38°. TD 1,674 ft. (Discovery of North Bourbon field in Illinois basin).

SOUTH LOUISIANA

Acadia Parish: Warren Petroleum Corp. 1 Navarro Unit, 61-8s-2e. IP 233 BCPD and 3,250 M.c.f. daily, 5/32-in., 54°, perforations 10,862-69 ft. TD 13,302 ft. (New pay in Rayne field.)

Allen Parish: Shell Oil Co. 1-A Bel et al, 10-6s-4w. IP 1,800 M.c.f. daily, dry gas, perforations 5,621-26 ft. TD 10,015 ft. (New field.)

Cameron Parish: California Co. 2 State Lease 2468, Grand Lake. IP 234 BOPD, ⅛-in., 36.5°, perforations 9,694-9,704 ft. TD 10,464 ft. (New pay in Grand Lake field.)

Lafourche Parish: Olin Gas Transmission Corp. 1 Hunt Harrison et al-State Lease 2767, Lake Enfermer. IP 187 BOPD, ⅛-in., 36°, perforations 10,326-30 ft. TD 14,171 ft. (New pay in Lake Enfermer field.)

Olin Gas Transmission Corp. 1 W. J. Harrison et al, 9-20s-23e. IP 4,120 M.c.f. daily and 172 BCPD, ¼-in., 56.4°, perforations 10,675-85 ft. TD 12,835 ft. (New pay in Lake Enfermer field.)

Plaquemines Parish: Richardson & Bass et al, 1-L. LL&E-Humble-State Lease 2414, 35-19s-27e. IP 134 BOPD and 177 M.c.f. daily, 7/64-in., perforations 21,419-35 ft. and 21,443-65 ft. TD 22,570 ft. (New field—world's deepest test and production.)

OKLAHOMA

Canadian County: Stanolind Oil & Gas Co. 1 Smith, 5 miles northwest of Short Junction field in NW NE 21-12n-5w. IPF 4 BOPD, Bois d'arc 8,203-11 ft., 34.4°, 8/64-in. choke. TD 8,293 ft. (Oil discovery).

Harper County: An-Son Petroleum Corp. 1 Freeman, 10 miles northwest of new production in Laverne district in C NW NW 6-27n-25w. IPF 2,900 M.c.f. of gas per day. Morrow sand 6,520-30 ft., 20/64-in. choke. TD 6,818 ft. (Gas discovery).

EAST TEXAS

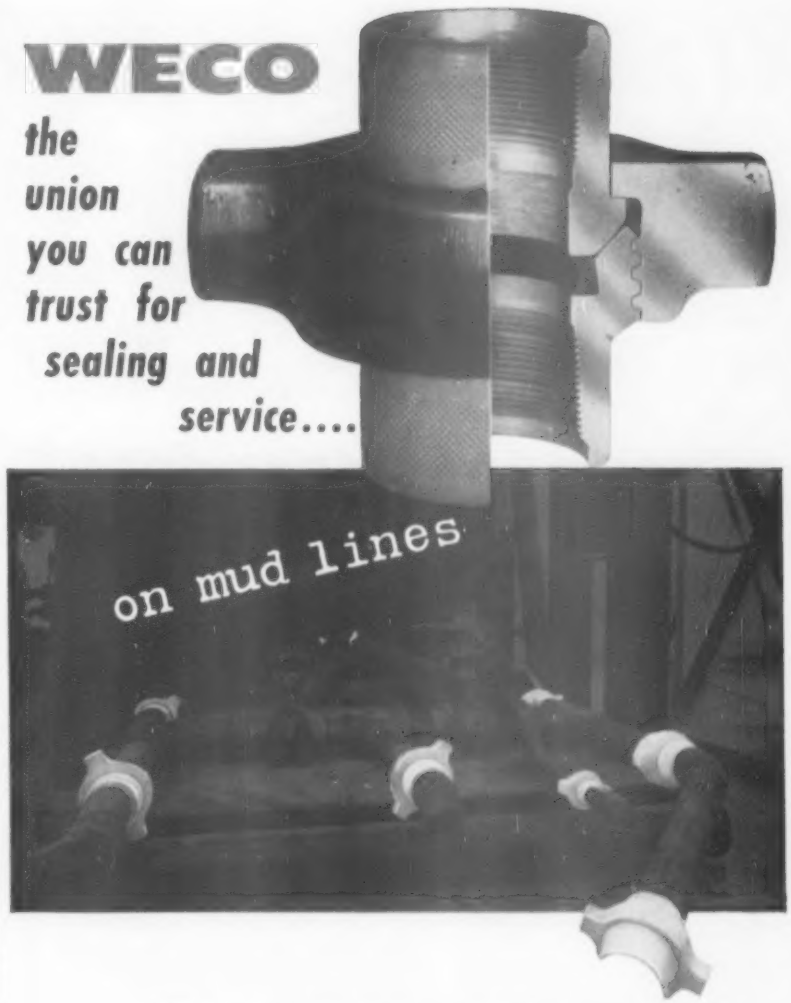
Cass County: F. R. Jackson 1 Morse, J. Taylor Sur., A-1029, 5 mi. E Kildare. IP 360 BOPD, ¼-in., TP 350 psi., 40°, GOR 498, Hill sand 5,952-62 ft. TD 6,160 ft., elev. 275 ft.

NORTH TEXAS

Clay County: Schulz & Brannan Drilling Co. 1 Lyles, Blk. 13, Webb Subd., 2 mi. SE Joy. IPP 66½ BOPD, 42°, GOR 372, Strawn 4,608-20 ft. TD 4,710 ft.

Cooke County: Maxwell Oil Co. 1 Miller, P. W. Owens Sur., A-803, 15 mi. NW Gainesville. IPP 145 BOPD, 38°, GOR 252, Bend conglomerate 6,824-34, 6,852-56 ft. TD 6,895 ft.

Montague County: Alma McCutchin 1 Perry Bros., M. B. Lewis Sur., A-424, 4 mi.



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W St. Jo. IPP 180 BOPD, 40°, GOR 460, perforated 6,371-83 ft. TD 7,269 ft.

Wilbarger County: Russell Maguire 1-A Waggoner, 1-17-H&TC, 10½ mi. SW Harrold. IPP 21 BOPD, 41°, Caddo 4,046-51 ft. TD 4,735 ft.

Wise County: Socs Vratis 1 Rowland, Sec. 1, Blk. 1, Cooke CSL, 5 mi. NE Chico. IP 289 BOPD, 16/64-in., CP 440 psi., GOR 785, 44°, Caddo conglomerate 5,424-36 ft.; IP 123 BOPD, 12/64-in., TP 990 psi., GOR 1950, 42°, Atoka conglomerate 5,651-80 ft. TD 5,775 ft.

Young County: Jeffson, Inc., 1 Baker, TE&L Sur. 2787, A-2058, 3 mi. NW Jeryn. IPP 38 BOPD, 39°, GOR 150, pay 3,294-3,300 ft. TD 3,600 ft.

WEST CENTRAL TEXAS

Fisher County: Skelly Oil Co. 1 Mahan, Elizah Bell Sur. 327, 2 mi. NE Sylvester. IP 88 BOPD, ⅜-in., TP 775 psi., GOR 33,751:1, 52.6°, top Goen sand pay 5,336 ft. TD 5,985 ft.

Taylor County: Drill Well Oil Co. 1-C Sayles, 20-4-T&P, 7 mi. SW Buffalo. IP 116 BOPD, 14/64-in., TP 65 psi., GOR 150, Flippen sand 2,641-45 ft. TD 2,694 ft.

Kewanee Oil Co. 1 Hawkins, Wm. Harris Sur. 405, 3 mi. E Ovalo. IPP 49.7 BOPD, 45°, GOR 905, Gray sand 4,190-98 ft. TD 4,281 ft.

Throckmorton County: Norman-Johnson-Buckalew-Lisle 1 Bruton, Sec. 2171, TE&L Sur., 8 mi. NE Throckmorton. IPP 38 BOPD, 40°, GOR 600, Strawn 3,304-09 ft. TD 3,314 ft.

TEXAS GULF COAST

Fort Bend County: The Texas Co. 2 Sliva, W. T. Lightfoot Sur., A-282. IP 194 BOPD, 5/32-in., 39.5°, perforations 8,216-24 ft. (first Yegua FB II sand). TD 8,600 ft. (New pay in Barb Mag field.)

The Texas Co. 3 Sliva, W. T. Lightfoot Sur., A-282. IP 67 BOPD, ⅞-in., 39°, perforations 8,074-80 ft. (Wendell F.B. 2 sand). TD 8,500 ft. (New pay in Barb-Mag field.)

Matagorda County: Shell Oil Co. 1 State Tract 487, Gulf of Mexico. IP 972 M.c.f. daily, ⅞-in., dry gas, perforations 3,674-86 ft. (Miocene G-3 sand), and (dual completion) 2,569 M.c.f. daily, ¾-in., dry gas, perforations 4,274-90 ft. (Miocene G-2 sand). TD 7,990 ft. (New pays in Kain field.)

Nueces County: Republic Natural Gas Co. and Forest Oil Corp. 1 State Tract 752, Nueces Bay. IP 2,450 M.c.f. daily, open-flow potential, GOR 100 M.c.f. per bbl., 57.2°, perforations 9,793-9,701 ft. TD 10,100 ft. (Discovery well West Portland field.)

San Patricio County: Jake L. Hamon 6-B Hodges, 3-A Victorian Juarez Sur., A-11. IP 80.08 BOPD, ⅛-in., 22.4°, perforations 3,227-30 ft. TD 3,238 ft. (New pay in Hodges field.)

SOUTHEAST TEXAS

Dimmit County: Pronto Drilling Co. 1 Cook, I&GN Sur. 26, A-816. IP 1,100 M.c.f. daily, open-flow potential, spray distillate, 60°, perforations 2,382½-88½ ft. (Olmos). TD 2,772 ft. (New field.)

Pronto Drilling Co. 1 Stewart et al, GWT &T Sur. 653, A-103. IP 2,500 M.c.f. daily, open-flow potential, dry gas, perforations 2,395½-2,401½ ft. (Olmos). TD 2,675 ft. (New field.)

Hidalgo County: Houston Oil Co. of Texas 1 Bach, Sec. 185, Farm Grant 385, West Tract, Llano Grande Grant. IP 19,000 M.c.f. daily, open-flow potential, GOR 94.8 M.c.f. per bbl., 53.2°, perforations 8,588-94 ft. TD 10,556 ft. (New pay in South Elsa field.)

PRODUCING WITH J&L SUPPLY

Into the J&L warehouse at your elbow is funneled day by day and hour by hour the latest production-equipment experience from 91 stores, 22 sales offices, and a vast network of alert resident salesmen.

This clearing house service for the United States and Canada enables you to produce more oil with less trouble and expense — a fundamental J&L concept of service.

J&L casing ready to set. API seamless in all grades. Made under rigid mine-through-mill controls. Sold and serviced by interested, enthusiastic J&L Supply men who know pipe.

This well gets a second break — the tubing is also J&L! Non-upset and external upset in all API grades, and J&L Integral Joint. "JONES & LAUGHLIN SEAMLESS" rolled in or stenciled on casing and tubing is a comfortable assurance to careful buyers. Made by a manufacturer with more than 100 years of progressive experience. Sold by J&L Supply men intent on service.

This producer means business! The base is poured and a Cabot in place — the most satisfactory pumping unit known to the industry. To complete the picture — to give this well just about every safeguard and advantage in the book — the pump and rods are Axelson. The rods have been heat treated and normalized from end to end to make them strong, ductile, shock-resistant. The pump has been tailor-assembled in a nearby J&L shop to fit *this* well. (Axelson Hol-O-Rods, first with integral ends, are also prime favorites with producers who keep a weather eye on progress in equipment.)

Simple but greatly advanced design and construction, plus immediate J&L parts service, make Cabot pumping units the best buy in the United States and Canada. One-man crank balance. Patented rubber tail bearing — eliminates friction, needs no lubrication, absorbs shock and vibration. Sykes-cut herringbone gears, flood lubricated. Timken and Hyatt bearings. Powered here with a Century motor.

Another picture of how to pump for more profit. Cabot units serviced by J&L Supply hold the world's records for faithful performance. Maximum polish rod loads from 3,000 to 32,000 lbs. Standard equipment: floor clearing sub-base, V-belts, belt guards, adjustable slide rails. Powered in this instance with a Fairbanks-Morse "ZC" engine.

J&L

The age of retirement for Axelson pumps has been abolished in the United States and Canada by J&L repair shops like this one in Shreveport, Louisiana. Each of these shops has highly specialized equipment and a wonderful assortment of spare parts. Never junk an Axelson; trained J&L men can make it literally as good as new. These shops have made misfits a thing of the past. A pump expertly tailored to fit your well is all in the day's work.

. . . and your J&L store is your warehouse for the very best of those thousand and one items you need from day to day — J&L pipe for flow lines, J&L skid-mounted pump units, tubing heads, stuffing boxes, polished rods, packers, regulators, electric motors and controls, valves, fittings, packings, lubricants, tools, paints. Items shown are for a tank battery hookup.

J&L Supply experience over a period of more than fifty years is yours to command and apply. Use it! Force lifting costs DOWN, profits UP. Get your J&L store on the telephone!

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

After oil hunting 30 years

. . . A Challenge Still His Dish

IN 30 years of oil hunting, a fellow picks up a lot of knowledge about the habits and habitats of elusive petroleum.

That's why G. J. Smith likes the challenge of his new job. He will be putting his 30 years' experience in oil-exploration work to the test. He's now superintendent of foreign exploration for Stanolind Oil & Gas Co.

His extensive background will come in handy for the company is engaged in a widespread search for new reserves in Cuba and Jamaica. And this province will be Smith's responsibility in his new post.

Starting out from scratch in looking for oil is nothing new to the former Houstonian who now headquarters in Tulsa. For he joined Pan American Production Co. in November 1936 shortly after it was organized. As he puts it, "Pan Am didn't have an acre of land or a barrel of production at the outset."

But in 20 years, Smith and his associates built it into a substantial producing company. They made major discoveries like those at South Gillock, Willamar, and Good Ranch (all in Texas) and South Pecan Lake in Louisiana.

Life of nomad . . . The likeable geologist got his introduction to geology at the University of Minnesota, where he earned a bachelor of science degree.

A native of the Gopher state, he prepped at East High School in Minneapolis. It was at the university that he met Mrs. Smith, the former Sarah Price.

Following graduation, Smith's first job was with the old California Co. (now Standard of Texas), doing surface geological work in West Texas for 18 months. Then came 3 years of similar work in behalf of Southern Crude Oil Purchasing Co., with more of the nomadic life typical of surface crews.

Next stop was with Gypsy Oil Co. (now part of Gulf), and 5 years of surface work in Northwest Oklahoma. With wide knowledge of the geology in that area, "Jerry," as he is known to friends, is watching the current boom in the Panhandle with a great deal of interest, though his interest is somewhat academic in terms of his present assignment with Stanolind.

A challenge . . . In 1935, Smith moved to Houston to join Shell as a subsurface geologist.

A year later, however, the challenge presented in helping a new company develop production proved too much. He shifted to Pan Am Production, as one of two subsurface geologists in the exploration department.

His work was largely confined to the Gulf Coast at the outset. But gradually Pan Am expanded its activities until it was operating all over Texas, Louisiana, Mississippi, and in southern Arkansas. Smith's personal progress matched the company's growth, and he became vice president in charge of exploration in 1951.

Another start . . . Now that Pan Am's operations are to be consolidated with those of Stanolind, Smith again finds himself at the helm of a new venture.

And he looks forward with keen anticipation to watching Stanolind's Caribbean activities blossom into full-blown production.

Formerly an avid hunter of duck, quail, and pheasant, Smith now finds little time for the sport. He explains, "It's a little too strenuous." So he confines his recreation to week-end golf and an occasional trout-fishing trip to Northwest Colorado.

He and Mrs. Smith are also busy grandparents. Their daughter, Patricia Jean, now Mrs. Franklin C. Broderick, Jr., of Houston, has two active little offspring who keep the family on the go. When both had their tonsils out on the same day recently, it was a major event.

Personals

Clarence L. Lee, formerly with Colombian Petroleum Co., is now senior geologist in the Colombian Division of Texas Petroleum Co.

C. C. Bimel, manager of Imperial Oil, Ltd.'s, crude purchasing division at Calgary since 1951, is moving to Cuba where he will be manager of the supply and transportation department of Esso Standard Oil, S.A.

Howard K. Nason, general manager of the research and engineering division of Monsanto Chemical Co., St. Louis, has been made a vice president.

Donald L. Kastner has been promoted to assistant division production superintendent at Odessa, Tex., by Cities Service Oil Co. Kastner, who was district engineer at Odessa, will supervise West Texas production operations.

John M. Parker, former geological department manager in Billings, Mont., for George J. Greer, Trustee, has been promoted to assistant general manager in Denver. **John J. Wanner,** production engineer, was transferred from Billings to Denver.

John H. Crump, Monroe, La., has been named vice president for oil and gas operations of United Gas Producing Co., subsidiary of United Carbon Co. He'll be headquartered in Monroe. Since 1954 Crump has been a director of Commonwealth Gas Corp. Earlier, he was vice president and exploration chief of Southwest Gas Producing Co.

W. A. Clark, The Texas Co., is new chairman of the New York Petroleum Section, A.I.M.E., and **W. A. Waag,** First National City Bank, is secretary-treasurer. Executive committee members are **Dale Nix,** Arabian American Oil Co.; **John H. Bowman,** Creole Petroleum Corp.; **Calvin B. Carter,** National Supply Co.; and **R. E. Westling,** Gulf Oil Corp.

William T. Knox and **Richard O. Wright** have been appointed assistant division directors by Esso Research & Engineering Co. Knox will direct development of home-heating equipment and oil-fired home air conditioners in the process research division. New uses for petroleum will also come under his supervision. Wright's new assignment is with the economics division. He was formerly supervising engineer of the division's refinery economics section.

Personals

ELLIOTT

Lloyd W. Elliott, vice president and director of Standard Oil Co. (N. J.), has been elected to the executive committee. He was president of Standard - Vacuum Oil Co. when he was elected to the board of Jersey Standard in 1951. Elliott was general manager of Standard-Vacuum operations in Java and Sumatra at the time of the 1942 invasion by the Japanese. He later handled all oil-supply operations in the Southwest Pacific for the Army, Navy, and Air Force. He was an Army colonel and member of General MacArthur's staff.

Arthur T. Freeman, formerly vice president in charge of exploration for Kin-Ark Co., has been made Kansas division manager for the Anschutz Drilling Co., of Wichita, Kans.

Alvin W. Simpson has been named to the newly created post of division production superintendent of Murphy Corp. at Shreveport, La. He moves up from staff production manager at El Dorado, Ark.

Fred M. Keller, Oceanic Oil Co. president since 1945, was elected chairman of the board and **J. Russell Sherman** was made president at a special meeting of the board May 28. Sherman, formerly with Standard Oil Co. of California, joined Oceanic in 1949 as vice president. He was promoted to executive vice president in 1951.

L. F. McCollum, Continental Oil Co. president, and **Charles J. Hares,** pioneer geologist in the Rocky Mountain area, received honorary doctor of engineering degrees from Colorado School of Mines. **Russell H. Volk,** Plains Exploration of Denver, was awarded the school's distinguished achievement medal.

Marshall C. Turner has been named manager of the newly created California Division of Monterey Oil Co. He will direct Monterey's development, drilling, and production in California and manage the operation of Monterey's gasoline plant at Huntington Beach. Prior to joining Monterey in 1953, he served as superintendent of Continental Consolidated Corp. at Long Beach and assistant to the chief production engineer for Phillips Petroleum Co., Bartlesville, Okla.

Robert J. Menzie, former supervising general engineer with the Federal Power Commission, has joined Tidewater Oil Co. as senior engineer in the gas utilization department in Houston. Menzie was with FPC 5½ years.

Helge Laursen, Tidewater Oil Co. geologist, has been transferred from Billings, Mont., to Albuquerque.

Wilbur H. Knight has resigned as district geologist for Union Producing Co. in Jackson, Miss., to join Larco Drilling Co. there.

William D. Leake has moved up from engineering trainee to production engineer with Richfield Oil Corp. He was transferred from Bakersfield to New Cuyama, Calif.

William C. Hubbard, Phillips Petroleum Co., production engineer, has been transferred from Pauls Valley, Okla., to Oklahoma City.

R. Renn Rothrock has been transferred from Barnsdall to Oklahoma City as assistant district superintendent with Sunray Mid-Continent Oil Corp.

Alex McCoy and **Herman Kaveler** have consolidated their consultant geology and geological engineering facilities. Headquarters are in Tulsa. Branch locations are Casper, Wyo., Denver, and Calgary. **R. Gordon Humphries** is resident manager and engineer.

Z. E. Wood, Phillips Petroleum Co. engineer, has been transferred from the natural gasoline department in Phillips, Tex., to the engineering department in Bartlesville, Okla.

M. Allen Day and **William G. Brownfield** have organized the Terra Exploration Co. in Tulsa. The firm specializes in a new approach in the use of magnetometer in subsurface checking. Day formerly headed the magnetics department of Consolidated Geophysical Surveys. Brownfield was a gravity interpreter for the same firm.

E. J. HAMNER

E. J. Hamner has been promoted by Humble Oil & Refining Co. from assistant exploration manager to director of exploration. He also was elected a director. Hamner succeeds **Morgan J. Davis,** recently named executive vice president.

Earl Ainsworth has been promoted to assistant manager of gas purchases by Northern Natural Gas Co. of Omaha.

Doyle R. Avant, Jr., Sun Oil Co. production engineer, has been transferred from Snyder, Tex., to Pampa, Tex.

Wilbur L. Durr, Continental Oil Co. geologist, has been transferred from Rapid City, S. D., to Lewiston, Mont.

Robert H. Lyddan has been appointed assistant director of the Geological Survey. He has been a member of the Interior Department agency since 1933.

Rex Barnes, Canadian Bishop Oil, Ltd., district geologist, will head a new office for the firm in Calgary. **William Smith** and **Lorence Falkenberg** will assist Barnes. Canadian Bishop is a wholly owned subsidiary of Bishop Oil Co.

Volney H. Kyle, Jr., has been named president of Colonial Natural Gas Corp. of Houston. The company is planning a gas line from Texas and Louisiana fields to Southeast Georgia and Florida. A subsidiary, North Carolina Natural Gas Corp., has been granted a certificate of convenience and necessity for a system which would bring gas from the main line of Transcontinental Gas Pipeline Corp. into North Carolina. Kyle moves to his new post from Michigan-Wisconsin Pipeline Co., where he was vice president.

William E. Lifson has been appointed an assistant director of the products research division of Esso Research & Engineering Co. He will be in charge of motor lubricants and wax and additives research.

Hans M. F. Fischer has been named assistant to the vice president in charge of the petrochemicals division of Commercial Solvents Corp. He succeeds **Thomas Potter,** who is now with Northwest Nitro-Chemicals, Ltd., a Commercial Solvents affiliate, at Medicine Hat, Alta.

Ralph B. McLaughlin will retire this year as chairman of the board of four pipeline companies. His resignation from the Texas Pipeline Co. will be effective September 1, the others July 1. The other firms are Texas-New Mexico Pipe Line Co., Texaco-Cities Service Pipe Line Co., and Kaw Pipe Line Co.

Max C. Eastman, Reserve Oil & Gas Co.'s vice president in charge of field operations since 1951, has been promoted to executive vice president. He'll move from Bakersfield to Reserve's San Francisco headquarters this month. For the past 5 years, Eastman has supervised extensive exploration and the development of important Tejon Ranch area discoveries. He was made a director of Reserve last year. Eastman was previously in charge of field operations for Navy's Elk Hills.

Neal Clayton has resigned as partner in Miles Exploration Co., Tulsa. He remains with Liberty Exploration Co.

John Scott Alcorn has resigned as geologist for Amerada Petroleum Co. in Midland, Tex., to become a consultant there.

Earl T. Pinney, former geophysicist for Stanolind Oil & Gas Co., will head a new Oklahoma City area office for Seis-Tech Exploration Co.

Vernon Wilson and **Joe McGuire,** Mt. Carmel, Ill., independents, have formed Mt. Carmel Drilling Co.

Paul D. Sweitzer, The Texas Co., has been promoted to drilling foreman at Pampa, Tex. He was field engineer at Monument, N. M.

Robert W. Parks, production engineer with Carter Oil Co., has been transferred from Great Bend, Kans., to Oklahoma City.

G. A. Grimma, assistant manager of Shell Chemical Corp.'s manufacturing development department since 1950, has been named to the new post of employe development manager. Other changes in the firm's manufacturing department: **D. B. Luckenbill,** from assistant operations superintendent, Houston chemical plant, to manufacturing operations section leader, New York; **A. W. Fairbairn,** from assistant superintendent, Martinez (Calif.) chemical plant, to section leader in the New York head office; **J. W. Hyde,** from chief engineer in Houston to succeed Luckenbill there; **R. M. Oaks,** from assistant chief engineer to succeed Hyde; and **M. H. R. Cogan,** from senior engineer in Houston to assistant chief engineer, succeeding Oaks.

Morris C. Minton has resigned as South Texas district geologist for Great Lakes Carbon Corp. to become a San Antonio consultant.

E. A. Morrison, British American Oil Producing Co. geophysicist, has been transferred from Denver to the southwestern division, Midland, Tex.

Herbert S. Chase, manufacturing vice president of Tidewater Oil Co.'s eastern division, has retired after 34 years' service.

John W. Schriever, last superintendent of Gulf Oil Corp's old Fort Worth refinery, has retired after 41 years' service.

W. E. Carr has resigned as district geologist for Blackwood & Nichols Co. in the four corners area to become an independent in Durango, Colo.

Frank W. Bowen has been shifted from superintendent of Sun Oil Co.'s 15,000-bbl. Sarnia refinery to the newly created post of refinery engineer at Marcus Hook, Pa. **Frederick A. Bain** succeeds Bowen as superintendent at Sarnia.

Tom Fitzgerald, Bakersfield, Calif., consultant, has been elected first president of that city's newly formed Petroleum Club. Other officers: **Jack Beach,** of Beach, Church & Bell, vice president; **Joe Thomas,** of Joseph McDonald Oil Co., secretary; and **Bob Culliton,** of Culliton & Clifton, treasurer.

Personals

Carl Worsham, South Central Texas production superintendent for Thos. D. Humphrey & Sons, Ltd., has been shifted from Ballinger to Abilene, Tex.

Ned Scott, Jr., Standard Oil Co. of Texas engineer, has been transferred from Gainesville, Tex., to Sherman, Tex.

Clyde A. Hurst has sold his cable-tool contracting business in Midland, Tex., to form the C. A. Hurst Construction Co. in Laurel, Miss.

Robert C. Bryan, Wichita independent geologist, has joined the geological department of Parker Petroleum Co., Inc., Ponca City, Okla.

Capt. C. G. Drescher, USN, will succeed **Col. Arnold C. Gilliam** as director of the Armed Services Petroleum Purchasing Agency June 14. This will be Drescher's second round as director. He served in the same position when ASPPA was first formed in 1948.

D. L. Campbell, vice president in charge of manufacturing, was one of four appointed to the board of British American Oil Co. recently. Others were **R. E. Repke,** executive vice president of British-American Oil Producing Co. in Dallas; **H. T. O'Neill,** vice president and treasurer; and **J. L. Lenker,** who left Gulf Oil Corp. to become a vice president of British American earlier this year.

DEATHS

George E. Hilton, long time independent oil producer, died in Oil City, Pa. He was 73.

Robert F. Garland, 65, pioneer oil man who discovered Oklahoma's Seminole field in 1926, died May 29 in La Jolla, Calif. His 1 Fixico blew in with a flow of about 6,000 bbl. daily. It was completed in Wilcox sand after unsuccessfully testing all familiar producing zones. Garland then organized Garland Oil Co. and later formed Arab Petroleum Co. He expanded his oil operations throughout Oklahoma and into Kansas, Illinois, and Texas, retaining much of the property after retiring from active development and exploration soon after World War II.

W. F. Pagel, 70, manager of the bolted tank department of the Columbian Steel Tank Co., Kansas City, died there recently. Pagel had been with the firm 39 years.

C. O. Ward, who was credited with drilling the first producing well in Burbank field, Osage County, Oklahoma, died in Tulsa recently. He was 81. Before moving to Oklahoma in the 1900's, Ward was active as a driller in Indiana, Wyoming, and Illinois.

Felix Livingston Gast, 80, retired pioneer oil man, died last week in Tulsa. He was head of the land department of the old Cosden Oil & Gas Co. in the 1920's, later becoming an independent operator.

Francis Fournier Reeve, 78, Canadian oil executive, died recently in Calgary, Alberta. He was president of Commonwealth Petroleum, Ltd., Commoil, Ltd., and Command Oils, Ltd.

SEPARATION EXPERT

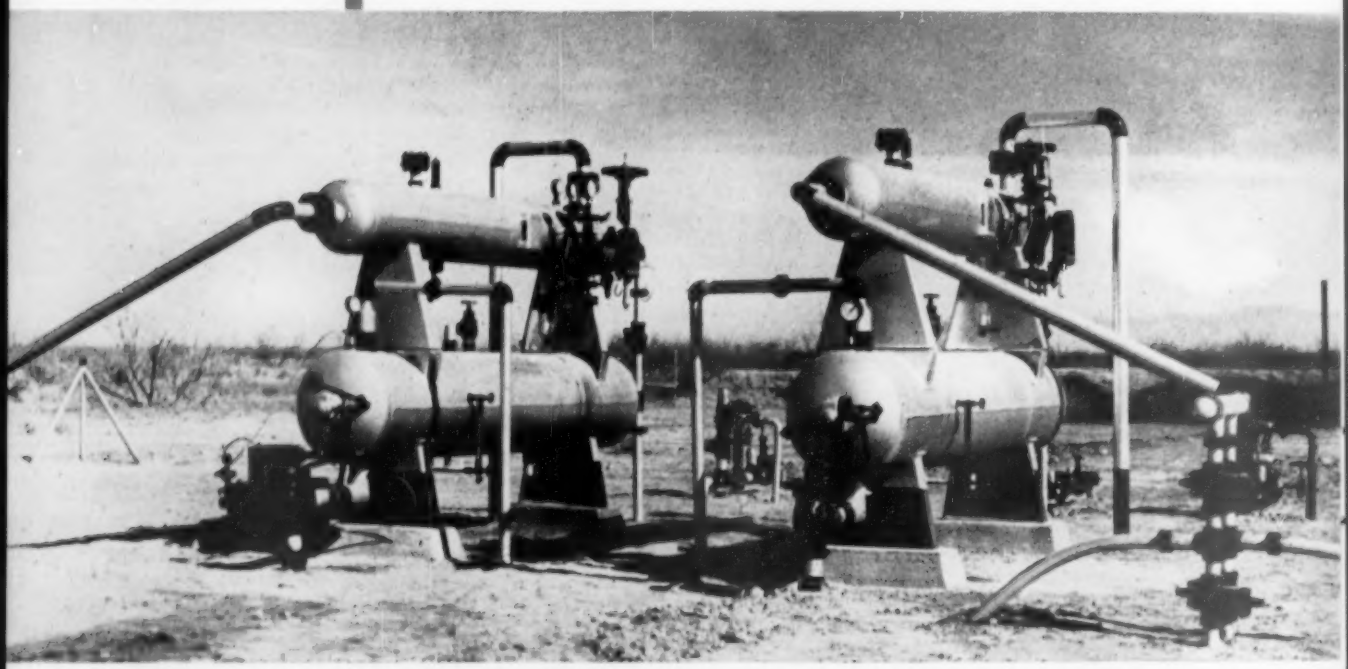
The PARKERSBURG Single Tube Separator

The expert efficiency with which the Parkersburg Single Tube Horizontal Separator separates oil from gas makes it unequaled for production-saving performance in the field.

For it is only with the Parkersburg Single Tube Separator that you get a slower gas flow that assures more natural separation . . . a greater interface area that increases opportunity for oil to give up maximum amount of gas . . . a longer retention time that provides more time for the gas to be released from the oil.

Furthermore, it is only with the Parkersburg Single Tube Horizontal Separator that you get the plus advantages of less freezing problems . . . easier cleaning . . . and easier unitization.

Why not put this production-saving, separation expert to work for you? Your Parkersburg Representative has all the facts.



Two Parkersburg Single Tube Separators combined for two-stage separation. Top vessel: 16" x 10' x 600 lbs. Bottom vessel: 24" x 10' x 125 lbs.

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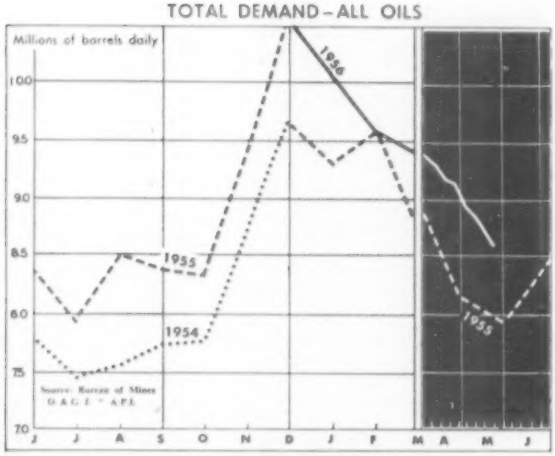
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,061,990	UP	8,300	UP	461,218
Crude stocks	276,224,000	UP	2,618,000	DOWN	2,794,000
Completions	1,120	DOWN	117	DOWN	71
Refinery runs	7,797,000	DOWN	51,000	UP	314,000
Gasoline stocks	183,510,000	DOWN	3,243,000	UP	14,137,000
Kerosine stocks	20,699,000	UP	768,000	DOWN	4,521,000
Distillate stocks	72,027,000	UP	3,532,000	DOWN	8,177,000
Residual stocks	34,787,000	UP	1,373,000	DOWN	9,369,000
Four-product stocks	311,023,000	UP	2,430,000	DOWN	7,930,000
Total imports	1,526,500	UP	176,400	UP	141,600

TOTAL DEMAND – ALL OILS



Market Events Indicate That Buyers Are Not Expecting a Price Increase

WIDELY scattered events in petroleum marketing indicate that at least part of the industry is not expecting price increases soon. Most of these events occurred in product marketing, but since a crude-price increase would mean higher product prices, these marketers seem to be betting against a boost in crude prices.

Recurring price wars at service stations are spreading again in New England and Pennsylvania. About a month ago these subnormal price conditions seemed to be moving toward normal markets. For the past 2 weeks, some marketers in the area seem to be interested more in moving gasoline today than in working toward a firm market for the summer.

Small discounts offered for summer fills of light heating oils in the New York Harbor area are not attracting new customers among the jobbers. Most of these resellers have contracts with a supplier along with a guaranteed billing price equal to the lowest quotation between time of purchase and the end of September. These jobbers know that if the market becomes soft, general quotations will be lowered and they will receive discounts on later purchases equal to the discount offered at the present. On the other hand, if prices increase before the jobber makes his summer purchases, he will have to pay the higher price for storage material. If these jobbers were expecting a price increase, they would be rushing to fill part of the available tank space with products at a discount. The fact that very little spot buying has been reported indicates that these jobbers are not expecting prices to go higher.

Some gasoline discounting continues in the Mid-Continent and North Central areas. Gasoline demand has been good for the year to date, but indicated demand in recent weeks has not been up to normal. Some jobbers and secondary suppliers filled all clean storage with gasoline before the last price increase but after the improved gasoline became available at pipeline stations. Some of them have been cutting these inventories back to normal over the past 2 weeks. If prospects for another increase were good, these tanks would stay full.

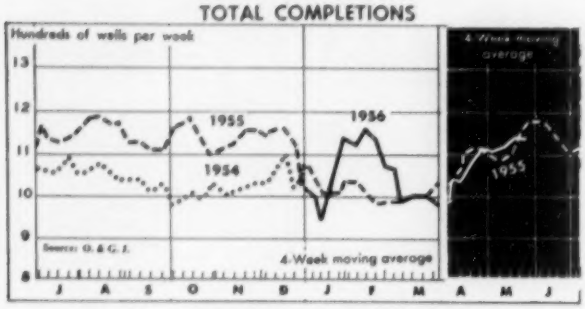
These events seem to indicate that marketers are not expecting higher prices.

Demand will be down in June . . . Total demand for all products decreases during warm weather with June near the low point of the curve. For the period 1950-55, total demand for all products during June averaged 95.8 per cent of the daily average for the year. (In these comparisons, the year 1952 was omitted since the refinery strike that year prevented normal changes in supply and demand during the summer months). Total demand for June was 8 per cent less than the daily average for the first quarter.

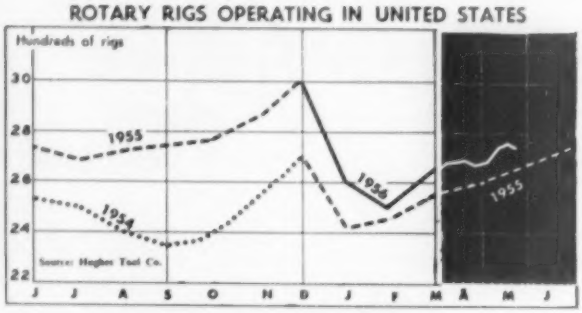
June refinery runs for the 1950-55 period averaged 1.4 per cent more than in the first quarter. The increase in product output at refineries combined with a decrease in product demand resulted in the shift from stock reductions in the first quarter to stock increases in June.

Since 1950, June has been a month of small increases in crude inventories. No additions are needed this year.

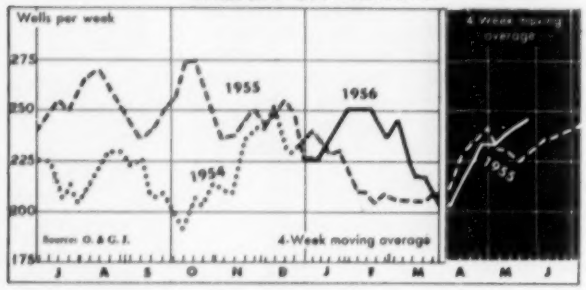
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	5-28-56	5-21-56	5-30-55
North Central and East	125	140	175
Southeast	29	28	38
Okla., Kans., Ark., Mo.	475	503	488
Louisiana	441	439	384
N. and E. Texas-Panhandle	436	447	414
Gulf and South Texas	251	270	235
West Texas-New Mexico	553	557	516
Rocky Mountain	251	256	255
Pacific Coast	112	128	141
Total United States	2,673	2,768	2,646
Western Canada	220	198	128

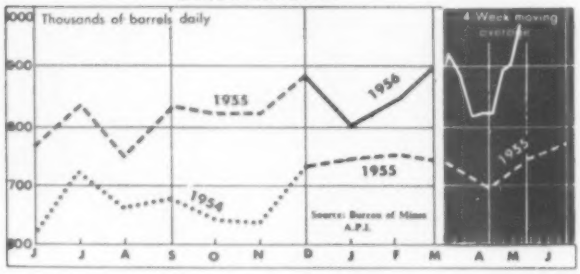
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MAY 26, 1956

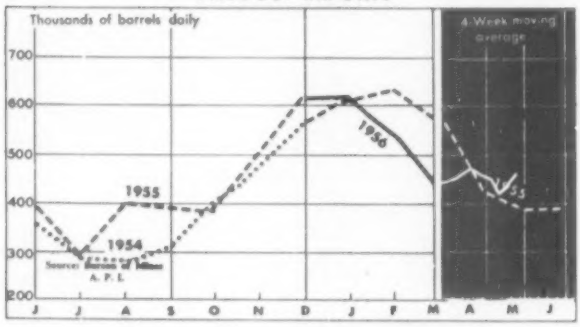
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	1	1	0	0	11,449	40	38	0	0	0	0	0	0	0	1	20	21
Arkansas	13	10	0	3	39,463	311	287	1	0	0	1	2	15	0	2	48	65
California	46	31	2	13	241,971	866	1,052	2	0	0	11	13	17	0	2	169	188
Colorado	27	9	2	16	138,145	469	549	2	0	0	10	12	11	0	6	202	219
Illinois	74	30	1	43	158,024	1,421	1,442	1	0	0	13	14	25	0	0	236	261
Indiana	11	3	0	8	17,624	242	308	0	0	0	1	1	8	0	1	42	51
Kansas	99	41	12	*46	329,743	2,026	2,069	2	0	0	19	21	48	1	10	354	413
Kentucky	20	9	1	10	26,836	657	498	0	0	0	2	2	15	0	1	144	160
Louisiana	76	38	14	24	604,138	1,537	1,608	3	0	3	12	18	45	28	27	207	307
North	28	17	1	10	90,693	591	857	0	0	0	6	6	10	1	1	76	88
South	41	18	13	10	463,556	756	751	3	0	3	6	12	30	24	17	116	187
Offshore	7	3	0	4	49,889	190		0	0	0	0	0	5	3	9	15	32
Michigan	9	2	0	7	25,567	180	205	0	0	0	6	6	4	0	0	61	65
Mississippi	8	2	0	6	53,583	179	196	1	0	0	4	5	7	0	1	68	76
Montana	10	4	0	6	41,670	132	131	0	0	0	3	3	5	0	0	33	38
Nebraska	22	7	0	15	130,596	383	280	1	0	0	8	9	16	0	0	176	192
New Mexico	31	1	30	0	120,161	704	581	0	0	0	0	0	20	0	5	59	84
Northwest	31	1	30	0	120,161	259	160	0	0	0	0	0	2	0	5	16	23
Southeast	0	0	0	0	0	445	421	0	0	0	0	0	18	0	0	43	61
North Dakota	5	2	0	3	33,742	92	92	0	0	0	2	2	6	0	0	19	25
Ohio	24	14	3	7	63,882	415	439	0	0	0	0	0	0	0	1	4	5
Oklahoma	156	100	6	†50	569,880	3,529	3,501	4	0	2	6	12	52	13	15	288	368
Pennsylvania-New York	4	0	3	1	10,932	410	682	0	0	0	0	0	0	0	3	2	5
Texas	454	246	22	186	1,680,988	8,776	7,921	15	0	6	110	131	313	20	79	1,895	2,307
Southwest (1 & 4)	63	32	7	24	209,596	1,267	1,235	1	0	4	11	16	60	5	28	352	445
Gulf Coast (2 & 3)	54	26	5	23	331,439	1,099	1,047	2	0	1	15	18	28	8	31	286	353
East (5 & 6)	14	7	2	5	77,832	450	385	1	0	0	5	6	7	1	5	165	178
North Central (7-B & 9)	205	91	1	113	550,945	3,157	2,847	10	0	0	61	71	141	0	2	753	896
West (7-C & 8)	87	68	1	18	408,935	2,308	2,000	0	0	1	17	18	74	0	7	313	394
Panhandle (10)	31	22	6	3	102,241	495	407	1	0	0	1	2	3	6	6	26	41
Utah	0	0	0	0	0	36	28	0	0	0	0	0	1	0	1	21	23
West Virginia	9	1	8	0	18,857	263	238	0	0	0	0	0	0	0	2	5	7
Wyoming	21	12	0	9	68,429	305	322	1	0	0	4	5	7	0	4	78	89
Miscellaneous	0	0	0	0	0	56	15	0	0	0	0	0	4	0	0	43	47
Total United States	**1,120**	563	104	453	4,385,680	23,029	22,482	33	0	11	212	**256**	619	62	161	4,174	5,016
Total previous week	1,237	679	86	472	5,007,887			30	1	14	219	264	586	62	150	3,962	4,760
Total May 28, 1955	1,191	666	62	463	4,647,895			32	4	8	217	261	616	92	148	3,808	4,663
Cumulative 1956	23,029	12,676	1,512	8,841	94,088,659												
Western Canada	49	40	1	8	258,537	896											

Service wells included: *3, †4.

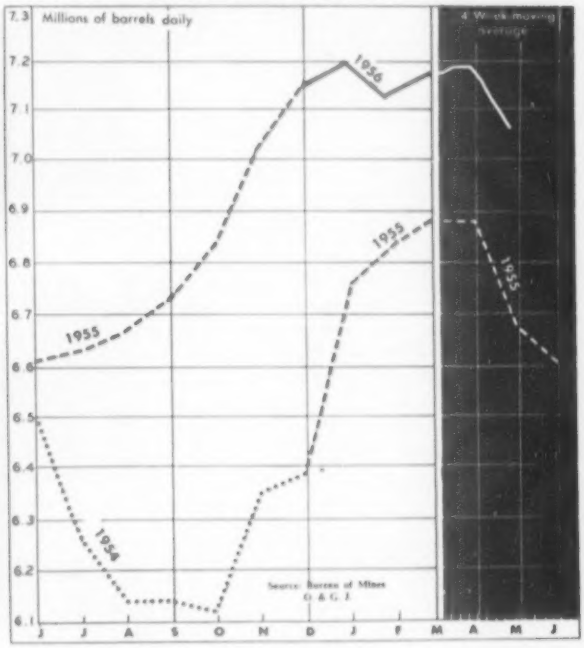
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

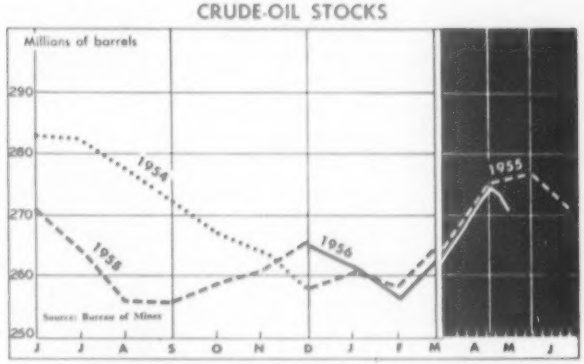


DAILY AVERAGE PRODUCTION FOR WEEK

	May 26, 1956 Crude oil	Lease condensate	Total	May 19 total
Alabama	5,100		5,100	5,000
Arkansas	72,450	500	72,950	72,600
California	966,200		966,200	965,400
Colorado	164,200		164,200	167,400
Eastern	49,400		49,400	49,000
Florida	1,375		1,375	1,375
Illinois	228,500		228,500	228,400
Indiana	31,600		31,600	30,700
Kansas	342,400		342,400	338,800
Kentucky	48,400		48,400	48,500
Louisiana	727,950	60,300	788,250	790,000
North	119,950	2,300	122,250	124,000
South	608,000	58,000	666,000	666,000
Michigan	29,700		29,700	29,800
Mississippi	107,000	3,700	110,700	110,700
Montana	58,800		58,800	53,700
Nebraska	38,500		38,500	37,200
New Mexico	241,400	3,200	244,600	244,700
North Dakota	24,700		24,700	27,800
Oklahoma	597,200		597,200	594,700
Texas	2,924,000	51,215	2,975,215	2,975,215
Dist. 1	54,800	425	55,225	55,225
Dist. 2	150,000	8,175	158,175	158,175
Dist. 3	425,700	25,000	450,700	450,700
Dist. 4	235,000	4,900	239,900	239,900
Dist. 5	45,000	450	45,450	45,450
Dist. 6	122,000	5,850	127,850	127,850
East Texas field	209,500		209,500	209,500
Dist. 7-B	152,000	50	152,050	152,050
Dist. 7-C	185,000	4,005	189,005	189,005
Dist. 8	1,042,000	1,800	1,043,800	1,043,800
Dist. 9	209,000	400	209,400	209,400
Dist. 10	94,000	160	94,160	94,160
Utah	5,300		5,300	5,300
Wyoming	278,600		278,600	277,200
Others	‡300		‡300	200
Total U. S.	6,943,075	118,915	7,061,990	7,053,690
Change from previous week, up			8,300	
Canada	†385,600		†385,600	†416,400
Total U. S. production January 1-May 26			1,045,137,135 bbl.	
Same period last year (crude plus cond.)			*994,788,720 bbl.	

*Includes 16,765,550 bbl. condensate. †Week ended previous Monday. ‡Nevada 200, S. Dakota 100.

CRUDE-OIL STOCKS



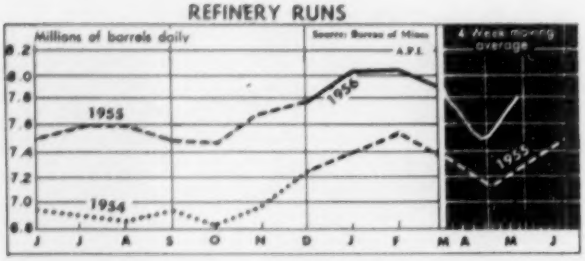
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

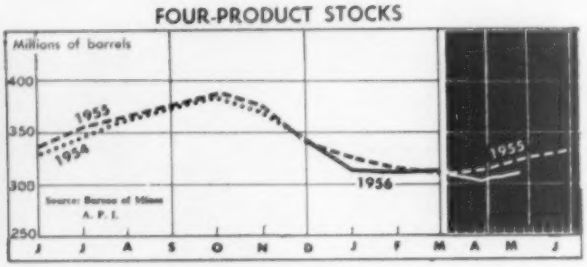
	5-19-56	5-12-56	5-21-55
Pennsylvania Grade	2,669	2,747	2,873
Other Appalachian	2,229	2,124	2,091
Illinois, Indiana, Michigan	10,609	10,012	12,996
Nebraska, North Dakota	2,410	2,320	2,336
Kansas	9,147	9,036	8,826
Oklahoma	27,200	26,734	24,836
Arkansas	3,039	3,058	2,922
Louisiana	16,729	16,784	16,731
North	2,542	2,646	2,654
South	14,187	14,138	14,077
Mississippi	2,936	2,956	2,887
New Mexico	7,541	7,507	8,923
Texas	126,743	125,814	128,631
East Texas proper	9,256	9,159	10,258
West Texas	62,150	62,101	56,410
Texas Gulf	22,883	22,906	26,360
Other Texas	32,454	31,648	35,603
Wyoming	17,240	16,857	15,732
Other Rocky Mountain	6,093	5,954	5,340
California	27,446	27,760	31,683
Foreign	†14,193	13,943	12,211
Total	276,224	273,606	279,018

*Bureau of Mines. †Includes 3,100,000 bbl. in California.

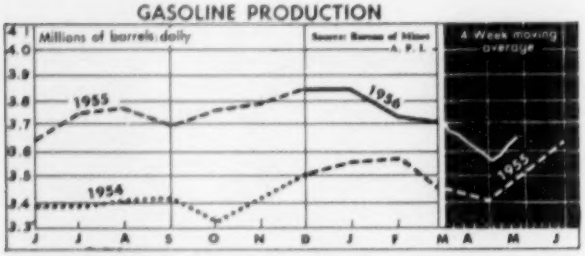
REFINERY RUNS



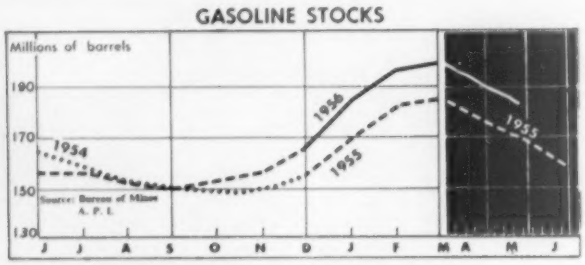
FOUR-PRODUCT STOCKS



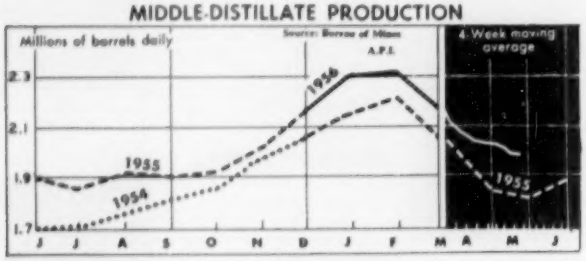
GASOLINE PRODUCTION



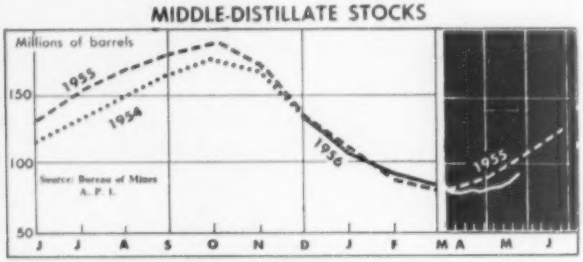
GASOLINE STOCKS



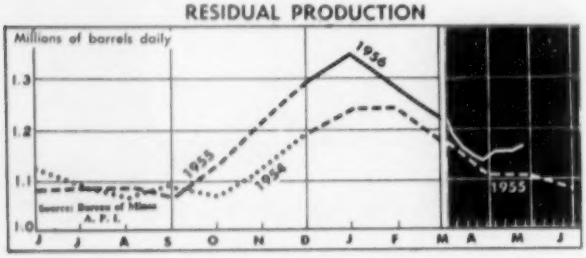
MIDDLE-DISTILLATE PRODUCTION



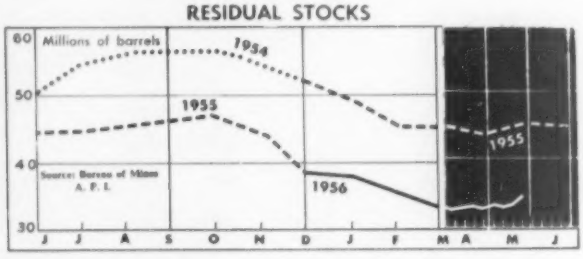
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, MAY 25

(Thousands of barrels)

District—	Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.	Stocks‡ — Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, May 1955 — Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.
East Coast	956	378.3	29.9	240.8	182.0	40,130	7,990	20,433	8,267	1,003	390.2	31.0	233.2	179.5
Appalachian:														
District 1	80	30.9	2.4	20.0	4.0	4,420	398	1,235	254	82	34.3	2.1	18.0	3.5
District 2	109	46.9	3.1	18.4	18.7	2,885	491	667	217	98	52.6	3.0	13.7	11.2
Ind., Ill., Ky.	1,354	678.0	64.3	268.7	170.2	34,488	3,503	9,895	3,984	1,345	678.0	66.7	243.1	158.7
Minn., Wis., Dak.	80	36.8	7.9	17.9	9.4	6,220	436	2,733	273	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	702	401.3	19.7	167.0	21.4	17,292	1,037	7,408	1,050	642	352.0	16.1	150.8	33.5
Inland Texas	289	204.3	4.4	61.4	23.1	6,731	416	1,394	1,393	251	190.0	8.4	47.8	22.9
Texas Gulf Coast	2,032	913.4	66.7	520.1	264.7	24,719	3,031	10,638	5,180	1,804	851.9	104.1	405.0	254.4
La. Gulf Coast	704	348.8	34.7	157.9	55.6	9,913	2,381	5,096	1,560	626	328.0	49.1	171.5	49.5
N. La. and Ark.	100	32.4	6.7	21.9	6.3	4,397	302	1,346	64	95	33.5	7.1	23.7	5.1
Rocky Mountain:														
New Mexico	22	11.6	.....	3.9	2.7	405	5	72	8	21	10.0	0.3	3.6	2.8
Other Rocky Mtn.	270	122.0	2.3	69.3	35.3	7,424	272	2,325	775	235	106.5	2.0	57.8	35.1
California	1,099	459.4	9.6	164.3	372.3	24,486	437	8,785	11,762	1,066	480.9	5.7	151.0	354.3
May 25, 1956	7,797	3,664.1	251.7	1,731.6	1,165.7	183,510	20,699	72,027	34,787	7,268	3,507.9	295.6	1,519.2	1,110.5
May 18, 1956	7,826	3,650.0	293.6	1,661.4	1,174.3	186,753	19,931	68,495	33,414	.....	.....	.....	.....	.....
May 27, 1955	7,483	3,524.1	313.7	1,534.0	1,152.9	169,373	25,220	80,204	44,156	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included with Ind., Ill., Ky.

Crude-oil and refinery prices at representative U. S. and foreign points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.75-12.00
Premium (96 octane)	13.50-13.75
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-12.00
Premium (97 octane)	13.00-13.25
Premium (98 octane)	13.25-13.75
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.40
Premium (93 octane)	14.0-14.25
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.25
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.5
Distillate No. 2	8.75-9.25
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.75

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

• Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.65
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.10-2.20

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	25-26
200 vis. neutral (180 at 100°), 25 p.t.	21.5

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M. (sour)	Wyo.
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$2.91	2.45	
25-25.9	2.64	2.60	2.93	2.47	$2.13
26-26.9	2.69	2.62	2.95	2.49	2.19
27-27.9	2.76	2.64	2.97	2.51	2.24
28-28.9	2.83	2.66	2.99	2.53	2.29
29-29.9	2.91	2.68	3.01	2.55	2.34
30-30.9	2.97	2.70	3.03	2.57	2.39
31-31.9	3.04	2.72	3.05	2.59	2.44
32-32.9	3.12	2.74	3.07	2.61	2.48
33-33.9	3.20	2.76	3.09	2.63	2.52
34-34.9	3.27	2.78	3.11	2.65	2.56
35-35.9	3.34	2.80	3.13	2.67	2.60
36-36.9	3.39	2.82	3.15	2.69	2.64
37-37.9		2.84	3.17	2.71	2.66
38-38.9		2.86	3.19	2.73	2.68
39-39.9		2.88	3.21	2.75	2.70
40 and up		2.90	3.23	2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas, and Wyoming (sweet). †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, May 16, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.45
Middle District	4.32
Southwest Pennsylvania	4.03
West Virginia	3.91
Buckeye Grade	3.85
Zanesville Grade	3.10
Illinois Basin	3.00
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.90
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-48.9°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0-34.9°, Abadan	1.86
Iraq, 36.0-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

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(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (USMC+30%)	$3.70
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2—20 MMCF LTX Units.
Vessels, Generators, Pumps, Instruments, Pipe, Valves, and Fittings and Other Equipment necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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GARDNER-DENVER 2-stage gas compressor, less engine, completely unitized with coolers, scrubbers and engine skid. Completely overhauled by Gardner-Denver. Perfect condition guaranteed. Gulf Southwest Service Co., P. O. Box 1328, Shreveport, La.

U-15 DRILLING RIG located in Beaver County, 3 NKU Waukesha Motors. Hydraulic Floor Operated Blowout Preventor, 131' Lee C. Moore Mast, steel mud pits, 7¾ x 16 Gardner-Denver pump, 8000' 4½" Drill Pipe recomplete. Call CEntral 2-6318, Oklahoma City, Oklahoma.

FAILING 1500 H.D. drill with 4½ x 5 pump, automatic pulldown, mounted on 1951 Ford. Also, Griffin water tank, mounted on 1951 Ford. Write P. O. Box 819, Longmont, Colo., Phone 1333.

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LINER FOR 5½" 2500' 4" od, 9.20 lb., 11½ thread. Number one. 85c. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE—2 truck mounted Bettis steam units. Good condition, equipped for oil field work. Box J-332, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 86' Oilwell Mast, with 4½ Substructure. Telephone: CE 2-6318, Oklahoma City, Okla.

ROYAL 118 Scintillometer for sale adaptable to survey oil or minerals. Slightly used, 2¼" crystal, 40% off. Box 10383, Dallas, Texas.

FOR SALE: Wilson-Snyder mud pump, 7¼" x 18". Top condition and less than half price. L. T. Peyton Machine Shop, Vernal, Utah. Phone 267.

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LINE PIPE: 2500' 7" OD 17 lb. Good body, 40' random lengths. Clean, straight, beveled, ready to lay. $1.00. M. J. Regan Pipe Co., Coffeyville, Kans.

2 MAYHEW SEISMOGRAPH RIGS—1 Model 600 mounted on 1954 F6 Ford with desired amount drill stem—4½ x 5 Gardner-Denver Pump. 1 Model 1000 mounted on 1952 F6 Ford with 300' drill stem—5 x 6 Gardner-Denver Pump. This equipment is in excellent condition. International Drilling Corporation, 314 Enterprise Building, Tulsa, Oklahoma.

FOR SALE—Approximately 44,000 feet good used 6⅝ inch lap weld line pipe, Double Random, beveled, racked at Neal, Kansas. Kenland Oil Company, 823 South Detroit Tulsa. Telephone Diamond 3-4933.

RECORDING INSTRUMENTS, fair condition, mounted on good truck. Dual power reels and cables. Bargain. Box J-460. The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 25,000 feet of 1½", H-40, Hydril "CS", new tubing, available immediately, $1.15 per foot. Box J-553. The Oil and Gas Journal, Tulsa, Oklahoma.

5½" SEAMLESS CASING, 10 lb., 20' random, 11½ thread, good as new. $1.25. M. J. Regan Pipe Co., Coffeyville, Kans.

FOR SALE: 1—Mayhew 2000 drilling rig mounted on F-8 Ford tandem, all new motors, 2000' 27/8" new National drill pipe 30' long. Winch truck with oil field bed, water tank, dog house on wheels, 2-wheel 10-ton pipe trailer, pick-up truck. Rig is in first class condition, all tools to drill with. Unit is now drilling in Illinois. If interested call FLanders 1-1010, St. Louis, Mo.

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

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PIPE WANTED. We are constantly in the market for carloads of used or substandard pipe 8⅝ and upwards. Box J-534, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

SOUTH AMERICA. Major Oil Company. Our Fee paid. Engineers, all types, Drilling Production—Pipeline—Gas, B.S. Degree, no experience required. Tool Pushers, 3 to 5 years experience. Pipeline Mechanic, 5 years experience. Foreman Gas, 5 years experience. Career employment. Age to 40. All information confidential. Contact CHAS. J. LOVELESS PERSONNEL SERVICE, 616 South Main, Tulsa, Oklahoma—GIbson 7-3193.

INDEPENDENT OIL OPERATOR needs geologist experienced in northeastern Oklahoma. Box J-529, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY OPERATORS
With minimum 7 years' oil refining experience. Must have experience on process units, such as crude distillation, thermal reforming, fluid catalytic cracking and reforming and thermal cracking. For refinery operation in Saudi Arabia.
Write outlining personal history and work experience.
Recruiting Supervisor, Box 136
ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, N. Y.

HELP WANTED

CHEMIST: Graduate chemist with a maximum of two years experience connected with refining operations. Excellent opportunity for advancement with a large independent refinery in the Southwest area. Salary according to qualifications. Box J-547, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST WANTED; Position open for experienced seismologist, supervisory work—West Texas-Southeast New Mexico area. Headquarters Midland, Texas. Requirements eight years minimum experience; one to two years West Texas-Southeast New Mexico. In reply give personal data, educational qualifications, and details of professional experience. Box J-535, The Oil and Gas Journal, Tulsa, Oklahoma.

Petroleum Geologists
Established Oil Company desires geologists for employment in West Texas area. Must know area and have four to six years of active experience in subsurface mapping and interpretation. Excellent opportunity for advancement. Salary will be commensurate with ability and experience. Reply should state age, education, experience, and salary desired.
BOX J-485,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

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Large Oil Refinery. Requires minimum of five years oil refinery experience in an executive capacity. Leadership qualities. Cost conscious. Flexible thinker. Engineering degree. Age 35-50. Our fee paid. Salary commensurate with ability and experience.
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- 35-45 years of age.
- 15 years' experience covering all phases materials activities, including minimum 8 years' foreign service.
- Modern methods stock control and ordering experience.
- High level administrative experience essential.

Send detailed resume to:
Box J-549,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

PROCESS ENGINEER: Graduate petroleum or chemical engineer with a maximum of two years experience connected with refining operations. Excellent opportunity for advancement with a large independent refinery in the Southwest area. Salary according to qualifications. Box J-546, The Oil and Gas Journal, Tulsa, Oklahoma.

AREA ENGINEERS

Several graduate engineers with minimum 5 years' experience supervising maintenance engineering functions in oil refining or producing facilities, power plants, heavy industrial installations, manufacturing plants or related operations. To establish technical supervision, procedures, maintenance operations and schedule routine and special work for major oil producing and refining operation with all supporting facilities; i.e., housing, feeding, recreation, etc.

Salary commensurate with background and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 64

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HELP WANTED

GEOPHYSICIST for West Coast operations of major oil company. Minimum requirements bachelor degree with some geological and mathematical background. No experience necessary, but up to two years advantageous. Box J-560, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Active independent oil company has vacancies for graduate petroleum engineers with two to five years of practical experience in drilling and production in West, West Central or North Texas. Excellent opportunities for growth and advancement. Replies should furnish complete personal data, education, experience, and starting salary desired

BOX J-300,
THE OIL AND GAS JOURNAL.
TULSA, OKLAHOMA.

DRILLING ENGINEER

Major drilling and production company has opening for young graduate petroleum engineer specializing in drilling techniques and machinery. Must have field experience in Mid-Continent area. Will work as assistant to Manager of Operations in Tulsa office. Good personality essential, age limit under 35. Give complete qualifications and education in reply.

Box J-550
The Oil and Gas Journal,
Tulsa, Oklahoma.

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PETROLEUM ENGINEERS

Major Oil Company has openings in Production Dept. in Venezuela for a number of graduate petroleum engineers.

OPENINGS also for petroleum, mechanical & chemical engineers for work in drilling, pipeline & gas depts. Salary commensurate with experience.

Please send details of Experience to:

P. O. BOX NO. 35
BOWLING GREEN STATION
NEW YORK 4, N. Y.

HELP WANTED

WANTED: Man for teaching staff and part-time research in Petroleum Engineering at Rocky Mountain School. Should have M.S. or better and some oil industry experience. State general qualifications in letter. Salary open. Jox J-517, The Oil and Gas Journal, Tulsa, Oklahoma.

INDEPENDENT REFINER in Mid-Continent area has opening for Assistant Plant Superintendent. Prefer graduate engineer with minimum of 5 years experience in the operation of vacuum and atmospheric distillation equipment. Box J-543, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEERS with minimum of four years experience wanted by expanding medium sized major oil company. Staff positions are in southwest locations. Please furnish information on degree held, detailed experience and state salary expected. All replies held confidential. Box J-536, The Oil and Gas Journal, Tulsa, Oklahoma.

TECHNICAL SERVICE MEN

Graduate engineers for field technical work by company licensing and servicing petroleum refining processes. All Replies Confidential.

Box J-545,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Experienced graduate engineers for immediate openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

RESERVOIR FLUID ANALYST

With degree in Physical Chemistry or Chemical Engineering plus 5 years' petroleum production engineering experience which should include 2 years' study of reservoir fluid behavior.

Salaries commensurate with training and experience. Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 116

ARABIAN-AMERICAN OIL COMPANY
505 PARK AVENUE

PETROLEUM ENGINEERS

Graduate Petroleum Engineers with 2 - 6 years' experience wanted by Major Oil Company for work in Mid-Continent and Gulf Coast areas. Openings available for Reservoir and Field Production Engineers. In first reply give resumé of experience, date available, and salary expected.

BOX J-479, THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

ENGINEER with a minimum of two years electric log experience wanted by oil reserve section of major oil company. Replies should furnish complete personal data, education, experience and starting salary desired. Box J-563, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. For technical, experienced oil men, under 40.

WANTED for oilfield equipment sales position; man experienced in drilling and production equipment with sales and administrative ability to work in New York with established manufacturers' export representative. Some foreign travel. Submit detailed resume of qualifications including experience, education, personal data and salary requirements. All replies confidential. Box J-558, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER

Independent Oil Co., Home Office San Antonio, Texas, engaged in general production business and purchasing oil and gas properties, desires services of petroleum engineer with experience in reservoir evaluation. Position will include evaluation prospective purchases and work on present production. Practical experience in completion of wells also desirable. Excellent permanent position. Written reply should furnish details sufficient to justify call for personal interview. Suggest some idea of salary requirements, living in San Antonio. Small photo would be helpful.

BOX J-548,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Process Engineers

Upper Midwest Refinery has openings for Chemical Engineers with up to Five years experience in process engineering, economics or operational engineering.

Please include complete resume of experience, education, salary expected and references with reply.

International Refineries, Inc.
PERSONNEL DEPARTMENT
Box #8
WRENSHALL, MINNESOTA

Construction ENGINEERS

FOREIGN EMPLOYMENT

Graduate Electrical, Mechanical, Civil or Chemical Engineers with minimum 10 years' experience supervising construction of industrial buildings, oil processing and oil handling facilities. Engineering degree essential. To assist in constructing expanding company facilities of major foreign operating oil company located in Saudi Arabia. Generous salary plus living allowance; liberal all-inclusive benefit program.

Write giving full particulars regarding personal history and work experience.

Recruiting Supervisor, Box 152

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, N. Y.

SITUATIONS WANTED

ATTORNEY-LANDMAN, 32, desires position with company engaged in foreign operations. Speak German, French. Honor graduate Law. Six years experience all phases Legal and Land. Major oil company experience, Division Attorney and District Landman, emphasis on Contracts and Negotiations. Also private law practice. Presently employed. Box J-554, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION GEOLOGIST—5 plus years experience in Mid-Continent and Rocky Mts., desires Rocky Mt. or foreign employment. Family man. Resume upon request. Box J-555, The Oil and Gas Journal, Tulsa, Oklahoma.

SEISMOLOGIST with twenty years experience desires geophysical work in Texas with oil company exploration department. Box J-557 The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—University graduate, 16 years experience 2 major companies and consulting in Rockies and Venezuela desires permanent position in either location. Full knowledge of exploration and managerial practices. 3102 Monte Carlo, Dallas, Texas.

MR. OIL MAN: Are you looking for a young, aggressive geologist with plenty of initiative? Six years Ark.-La.-Tex. and West Texas major Co. experience. Am looking for work not a position. Box J-540, The Oil and Gas Journal.

GEOPHYSICIST: 18 years experience in all active areas. Masters degree in physics, mathematics, geology. Desires position with small company or active independent on interest basis. Mid-Continent location preferred. Box J-559, The Oil and Gas Journal, Tulsa, Oklahoma.

LLB-BA (OU '39) Land Department, Office Management. Resident Wichita, Kansas. Will relocate. Full resume on request. Box J-556, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—ten years interpretation and field supervision. Desire position with oil company. Box J-503, The Oil and Gas Journal, Tulsa, Oklahoma.

CPA, BBA, 34, FAMILY—diversified experience in public accounting, heavy in income taxes, top level oil accounting experience in production, pipe line, refinery, marketing, including LPG, seeks challenging position as Controller Assistant Controller, or Auditor. Available reasonable notice. Box J-533, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOL. ADV. DEG.—16 years domestic, foreign, speak Spanish, prod., eng., drill. background, desires consultation retainer, part time employment, consider full time position, qualified handle land, geol., drill., prod. John O. Allen, 5816 N.W. 58th St., Oklahoma City.

EXECUTIVE

CHIEF ASSET: Ability to develop and lead hard-working, enthusiastic team. Constructive planner with desire and ability to follow through. Active, decisive, optimistic. Enjoy travel. Skilled writer. Good appearance. Age, 48. Experience: Sales, advertising, public relations, foreign and domestic. Complete knowledge oil industry. Will relocate.

BOX J-544,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628, Hobbs, New Mexico
Phone 3-3141.
146 Allen Building, Midland, Texas
Phone 2-2962.

SITUATIONS WANTED

GEOPHYSICAL SUPERVISOR, desires to continue working in the Rocky Mountain area. Interested in employment with oil company or geophysical contractor. Located in northern Rocky Mountain area at present. Box J-562, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

PRODUCING ROYALTY For Sale: 1/128 of 1/8 override equal to 164 royalty acres on 3000 ac. So. Tex. lease has one recently completed gas-distillate well. Price $30 per royalty acre. Chas. H. Houston, Milam Bldg. San Antonio, Tex.

WANTED

WANTED: Financial help to drill 100 acre lease, nine sands encountered to 1400 feet. Early Pennsylvania sand 250 feet deep, 550 feet best prospects. Wells pumping on joining lease. Atoka Co., Okla. Have Rig, Truck, Tools. Box J-537, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED

TO PURCHASE oil production or corporations having production for cash or stock in a listed company (or combination of both). All replies strictly confidential. Box J-412, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

CAPITAL CONTACT. Will consider placing proposition requiring corporate financing on Underwriting basis. Confidential. Write Consultant, 817 51st St., Brooklyn, N. Y.

HAVE CAPITAL available to develop oil properties for participating interest. Box J-512, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—A wonderful opportunity to buy a well established (20 years) "Cable Tool" drilling business (gas & oil) located 50 miles from Windsor, Ontario in Canada. 4 rigs capable of drilling from 1,500 to 5,000 ft., drilling and fishing tools. Trucks and a yard. Two acres of land. Two rigs running now, 2 more could be. Lots of drilling to be done. Reason for selling, ill health. Dr.'s orders. Box J-561, The Oil and Gas Journal, Tulsa, Oklahoma.

$100,000.00 WANTED—For developing PATENTED repressuring, well treating and acidizing process. Test proven. Faster, cheaper, superior to water. Increases production in new wells. 80% plus recovery of residual and so called unrecoverable oil. Beneficial to both formation and contents. Shallow fields available, many wells, several million bbls. oil remaining to start on. Approved by petroleum engineers and geologists. Be active or inactive. Stoddard Oil Company, 1917 Stevens Avenue, Minneapolis 3, Minnesota. Telephone FEderal 5-1473.

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LEASE AND DRILLING BLOCKS

HAVE SHALLOW BLOCKS in Western Kentucky for sale, one semi-proven with 3 shallow pays 1050', 1250', 1600'. Contact D. C. Holman, 605 S. E. Riverside Drive, Evansville 13, Indiana.

140 ACRES, good geology. Was offset to south, 16 inches in sand filled 700 feet with oil, pipe run, Tanks set, well started flowing 76 barrels. Offset to northeast, completed and made 36 barrels per day flowing its production. ¾ interest $4200.00. ½ interest $2800.00. ¼ interest $1400.00. ⅛ interest $700.00. 1/16 interest $350.00. 1/32 interest $175.00. Write O. A. Sewell, P. O. Box 103, Coweta, Oklahoma.

NEWLY PROVEN Shallow Gas Field, Southern Wyo. T. 12 & 13 N. R. 92 W. Carbon County. 4 proven sands. 4280 acres, entire structure. Surrounded by Major oil company holdings. Will sell ½ interest, $5 per acre cash and deep test. S. Marvin James, 901 Sherman St., Denver, Colo. Phone TAbor 5-2192.

80 ACRE LEASE, Greenwood County, Kansas. Bartlesville oil, 40 gravity. Two producing, one disposal. Undrilled locations. RR #2, Box 253, Caney, Kansas. Phone 422.

FOR SALE: Producing oil and gas wells and leases located in Garvin, Stephens, Kiowa Counties, Oklahoma. For details call or write, Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

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B. D. BUCKLEY
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FOR SALE—Oil Lease of 100 acres located near St. Jo, Texas, with one producing well. Other possible drilling locations that look good. Reasonably priced. Write W. E. Davis, Acme Equipment Co., 126 S. Clinton St., Chicago 6, Illinois, or phone ANdover 3-3430.

REAL ESTATE

19,000 ACRES, choice of finest spot West Coast Marion County, Florida. Cattle capacity 2,500. Fruits. Annual income $75,000. 2,200 Acres near Topeka, Kansas. Many others. John Showalter, Lincoln, Nebraska, 1433 Que.

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John G. Seiler Elected President of Tube Turns

John G. Seiler has been elected president of Tube Turns, Louisville, Ky., a division of National Cylinder Gas Co., Chicago. The announcement was made by Charles J. Haines, president of National Cylinder Gas. It followed a meeting of the corporation's board of directors.

Seiler joined Tube Turns in 1930. In 1931 he was appointed sales manager. He was later made vice president, and general sales manager in 1945. He was elected a vice president of National Cylinder Gas at the same time he was elevated to the presidency of Tube Turns.

Grant and MacClatchie Open New Odessa Division

Grant Oil Tool Co. and its subsidiary, MacClatchie Manufacturing Co., have recently opened new division headquarters at Odessa, Tex., with Rex Walling as division manager.

The new combination warehouse and office building, containing about 10,000 sq. ft. of floor space, has been designed for warehousing complete stocks of MacClatchie products and Grant tools, together with full service facilities.

The Odessa division is base headquarters for Grant and MacClatchie branches at Hobbs, N. M., and at Oklahoma City. Each of these branches warehouse Grant tools and MacClatchie products for their respective areas.

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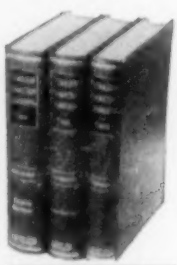

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Gives Operator and line sizes.

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Youngstown Sheet and Tube Company Inside Back Cover

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Billings, Montana. Notice is hereby given that six parcels of land totaling 819.27 acres within the known geologic structure of Kevin-Sunburst Field in Toole County, Montana, and 56 parcels of land totaling 24,486.66 acres within the known geologic structure of Bowdoin Field in Phillips and Valley Counties, Montana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 9:00 a. m., M.S.T., July 17, 1956, when bids will be opened. The following are the lands offered for sale: KEVIN-SUNBURST Field, T. 34 N., R. 3 W., P. M., Montana. Parcel 1: Sec. 1; Lots 3, 4, $SW\frac{1}{4}$ $NW\frac{1}{4}$ containing 119.97 acres; Parcel 2: Sec. 2; Lots 1, 2, $S\frac{1}{2}$ $NE\frac{1}{4}$ containing 159.90 acres. T. 35 N., R. 2 W., P. M., Montana. Parcel 3: Sec. 7; $SE\frac{1}{4}$ $SE\frac{1}{4}$ containing 40.00 acres; Parcel 4: Sec. 8; $E\frac{1}{2}$ $NW\frac{1}{4}$, $NE\frac{1}{4}$ $SW\frac{1}{4}$, $E\frac{1}{2}$ $NW\frac{1}{4}$ $SE\frac{1}{4}$ containing 140.00 acres; Parcel 5: Sec. 33; $N\frac{1}{2}$ $S\frac{1}{2}$, $SW\frac{1}{4}$ $SW\frac{1}{4}$ containing 200.00 acres. T. 35 N., R. 3 W., P. M., Montana. Parcel 6: Sec. 35; $SE\frac{1}{4}$ containing 160.00 acres. BOWDOIN FIELD, T. 30 N., R. 34 E., P. M., Montana. Parcel 7: Sec. 2; Lots 1, 2, 3, 4, 7, 8, 9, 10 containing 260.32 acres; Parcel 8: Sec. 3; Lots 1, 2 containing 47.73 acres; Parcel 9: Sec. 3; Lot 12 Sec. 4; Lot 9 containing 85.17 acres; Parcel 10: Sec. 4; Lots 4, 5, 12 containing 104.25 acres; Parcel 11: Sec. 5; Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 containing 420.08 acres. T. 31 N., R. 33 E., P. M., Montana. Parcel 12: Sec. 2; $SW\frac{1}{4}$ containing 160.00 acres; Parcel 13: Sec. 3; $S\frac{1}{2}$ containing 320.00 acres; Parcel 14: Sec. 8; $S\frac{1}{2}$ containing 320.00 acres; Parcel 15: Sec. 9; all containing 640.00 acres; Parcel 16: Sec. 10; all containing 640.00 acres; Parcel 17: Sec. 11; $NW\frac{1}{4}$, $S\frac{1}{2}$ containing 480.00 acres; Parcel 18: Sec. 14; all containing 640.00 acres; Parcel 19: Sec. 15; all containing 640.00 acres; Parcel 20: Sec. 17; all containing 640.00 acres; Parcel 21: Sec. 18; Lots 1, 2, 3, 4, $E\frac{1}{2}$ $E\frac{1}{2}$ $W\frac{1}{2}$ containing 629.14 acres; Parcel 22: Sec. 19; Lots 1, 2, 3, 4, $E\frac{1}{2}$, $E\frac{1}{2}$ $W\frac{1}{2}$ containing 630.94 acres; Parcel 23: Sec. 22; $NW\frac{1}{4}$ containing 160.00 acres; Parcel 24: Sec. 24; $SW\frac{1}{4}$ containing 160.00 acres; Parcel 25: Sec. 25; all containing 640.00 acres; Parcel 26: Sec. 26; $E\frac{1}{2}$, $NW\frac{1}{4}$ containing 480.00 acres; Parcel 27: Sec. 27; $NE\frac{1}{4}$ containing 160.00 acres. T. 31 N., R. 34 E., P. M., Montana. Parcel 28: Sec. 31; Lots 1, 2, 3, 4, $E\frac{1}{2}$, $E\frac{1}{2}$ $W\frac{1}{2}$ containing 640.08 acres; Parcel 29: Sec. 32; all containing 640.00 acres; Parcel 30: Sec. 33; $S\frac{1}{2}$ containing 320.00 acres; Parcel 31: Sec. 34; $SE\frac{1}{4}$ $NE\frac{1}{4}$, $NE\frac{1}{4}$ $SE\frac{1}{4}$, $S\frac{1}{2}$ $SE\frac{1}{4}$, $SW\frac{1}{4}$ containing 320.00 acres; Parcel 32: Sec. 35; $E\frac{1}{2}$, $SE\frac{1}{4}$ $NW\frac{1}{4}$, $E\frac{1}{2}$ $SW\frac{1}{4}$ containing 440.00 acres. T. 32 N., R. 31 E., P. M., Montana. Parcel 33: Sec. 2; Lots 3, 4, $S\frac{1}{2}$ $N\frac{1}{2}$, $SW\frac{1}{4}$ containing 401.14 acres; Parcel 34: Sec. 3; Lots 1, 2, 3, $S\frac{1}{2}$ $N\frac{1}{2}$, $S\frac{1}{2}$ containing 601.19 acres; Parcel 35: Sec. 3; Lot 4 Sec. 4; Lots 1, 2, $S\frac{1}{2}$ $NE\frac{1}{4}$, $SE\frac{1}{4}$ containing 361.95 acres; Parcel 36: Sec. 9; $E\frac{1}{2}$ containing 320.00 acres; Parcel 37: Sec. 10; all containing 640.00 acres; Parcel 38: Sec. 11; $N\frac{1}{2}$, $N\frac{1}{2}$ $S\frac{1}{2}$, $S\frac{1}{2}$ $SE\frac{1}{4}$, $SE\frac{1}{4}$ $SW\frac{1}{4}$ containing 600.00 acres; Parcel 39: Sec. 14; $E\frac{1}{2}$, $E\frac{1}{2}$ $W\frac{1}{2}$ containing 480 acres; Parcel 40: Sec. 15; $NW\frac{1}{4}$, $NW\frac{1}{4}$ $SW\frac{1}{4}$, $S\frac{1}{2}$ $SW\frac{1}{4}$ containing 280.00 acres; Parcel 41: Sec. 21; $E\frac{1}{2}$ containing 320.00 acres; Parcel 42: Sec. 22; $NW\frac{1}{4}$ $NE\frac{1}{4}$, $N\frac{1}{2}$ $NW\frac{1}{4}$, $S\frac{1}{2}$ $N\frac{1}{2}$, $S\frac{1}{2}$ containing 600.00 acres; Parcel 43: Sec. 23; $N\frac{1}{2}$ $NE\frac{1}{4}$, $NE\frac{1}{4}$ $NW\frac{1}{4}$, $S\frac{1}{2}$ $N\frac{1}{2}$, $S\frac{1}{2}$ containing 600.00 acres; Parcel 44: Sec. 25; $W\frac{1}{2}$ containing 320.00 acres; Parcel 45: Sec. 26; all containing 640.00 acres; Parcel 46: Sec. 27; all containing 640.00 acres; Parcel 47: Sec. 35; $N\frac{1}{2}$, $SE\frac{1}{4}$ containing 480.00 acres; Parcel 48: Sec. 36; all containing 640.00 acres. T. 33 N., R. 31 E., P. M., Montana. Parcel 49: Sec. 13; $W\frac{1}{2}$ containing 320.00 acres; Parcel 50: Sec. 14; Lot 1, $E\frac{1}{2}$, $NW\frac{1}{4}$ $NE\frac{1}{4}$, $NE\frac{1}{4}$ $NW\frac{1}{4}$, $W\frac{1}{2}$ $NW\frac{1}{4}$, $NW\frac{1}{4}$ $SW\frac{1}{4}$ containing 399.32 acres; Parcel 51: Sec. 15; $N\frac{1}{2}$, $N\frac{1}{2}$ $S\frac{1}{2}$, $S\frac{1}{2}$ $SW\frac{1}{4}$ containing 560.00 acres; Parcel 52: Sec. 21; $NW\frac{1}{4}$ $NW\frac{1}{4}$, $S\frac{1}{2}$ $NW\frac{1}{4}$, $SW\frac{1}{4}$, $W\frac{1}{2}$ $SE\frac{1}{4}$ containing 360.00 acres; Parcel 53: Sec. 22; Lots 4, 10, 11, 13, $N\frac{1}{2}$ $NW\frac{1}{4}$, $SW\frac{1}{4}$ $NW\frac{1}{4}$, $SE\frac{1}{4}$; Sec. 23; $SW\frac{1}{4}$ $SW\frac{1}{4}$; Sec. 27; Lot 2 containing 394.84 acres; Parcel 54: Sec. 23; Lots 1, 3, 5, 7, 8, $NE\frac{1}{4}$ $NE\frac{1}{4}$; Sec. 22; Lot 8; Sec. 24; $N\frac{1}{2}$ $NW\frac{1}{4}$ containing 256.93 acres; Parcel 55: Sec. 26; Lot 1, $SE\frac{1}{4}$ $NE\frac{1}{4}$, $W\frac{1}{2}$ $NE\frac{1}{4}$, $W\frac{1}{2}$ containing 478.24 acres; Parcel 56: Sec. 27; $E\frac{1}{2}$, $SE\frac{1}{4}$ $NW\frac{1}{4}$, $E\frac{1}{2}$ $SW\frac{1}{4}$, $SW\frac{1}{4}$ $SW\frac{1}{4}$; Sec. 28; $SE\frac{1}{4}$ $SE\frac{1}{4}$ containing 320.00 acres; Parcel 57: Sec. 28; Lots 2, 4, 5, 6, 9; Sec. 29; Lots 2, 6, 7, 8, 10 containing 294.74 acres; Parcel 58: Sec. 28; $NW\frac{1}{4}$ $NE\frac{1}{4}$, $N\frac{1}{2}$ $NW\frac{1}{4}$; Sec. 29; $N\frac{1}{2}$ $N\frac{1}{2}$, $SW\frac{1}{4}$ $NE\frac{1}{4}$, $S\frac{1}{2}$ $NW\frac{1}{4}$ containing 400.00 acres; Parcel 59: Sec. 32; all containing 640.00 acres; Parcel 60: Sec. 33; all containing 640.00 acres; Parcel 61: Sec. 34; $N\frac{1}{2}$, $N\frac{1}{2}$ $S\frac{1}{2}$, $SW\frac{1}{4}$ $SW\frac{1}{4}$ containing 520.00 acres; Parcel 62: Sec. 35; $NW\frac{1}{4}$ containing 160.00 acres.

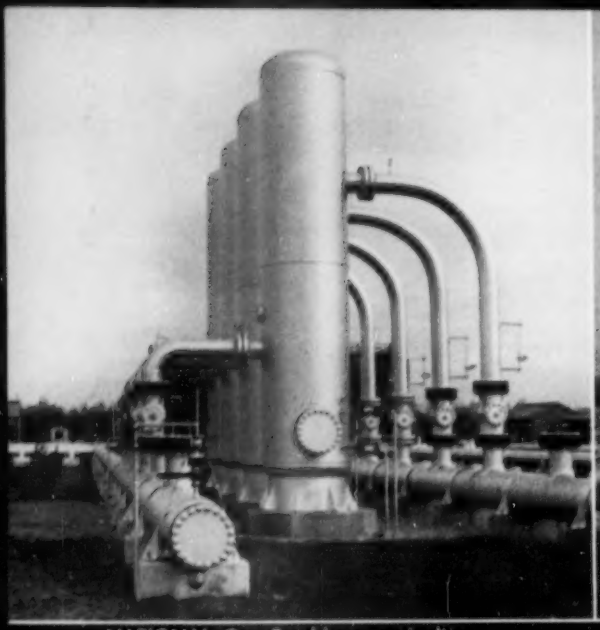
The following described land located in Parcels 44, 45, 46, 47, and 48 are subject to the provisions of stipulations identified as 3g and 12. T. 32 N., R. 31 E., P. M., Montana. Sec. 25; $S\frac{1}{2}$ $SW\frac{1}{4}$; Sec. 26; $SW\frac{1}{4}$ $NE\frac{1}{4}$, $S\frac{1}{2}$ $NW\frac{1}{4}$, $SE\frac{1}{4}$, $E\frac{1}{2}$ $SW\frac{1}{4}$, $NW\frac{1}{4}$ $SW\frac{1}{4}$; Sec. 27; $S\frac{1}{2}$ $NE\frac{1}{4}$, $SE\frac{1}{4}$ $NW\frac{1}{4}$, $N\frac{1}{2}$ $SE\frac{1}{4}$, $SW\frac{1}{4}$ $SE\frac{1}{4}$, $SW\frac{1}{4}$; Sec. 35; $NE\frac{1}{4}$; Sec. 36; all. Separate bids must be submitted on each parcel. The successful bidder (s) will reimburse the Bureau of Land Management for their proportionate share of the local publication cost of this sale. Details of the lease offering, special stipulations, and how and where to submit bids may be obtained from the Manager, Land Office, 1245 North 29th Street, Billings, Montana. Orval G. Hadley, Manager, Land Office.

LEGAL

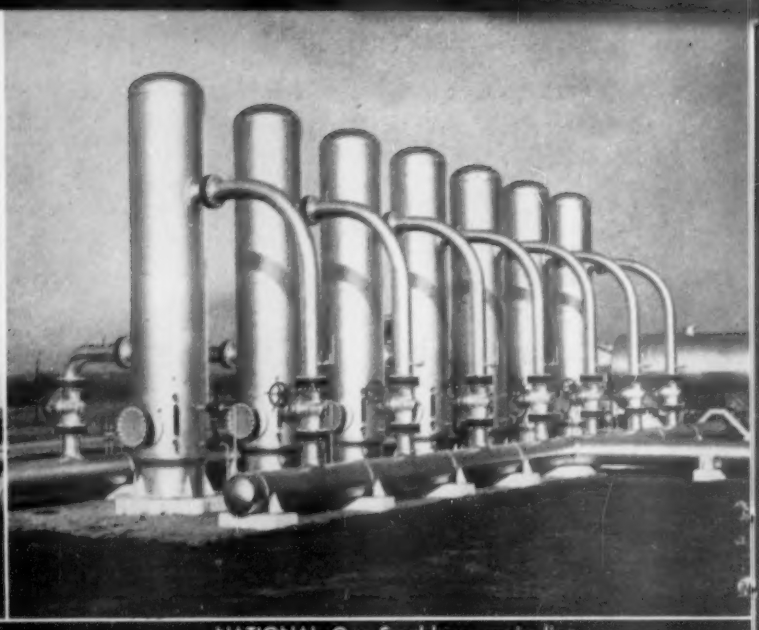
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 40 acres of land in one parcel, within the known geologic structure of Williams Park Anticline, Routt County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m. M.S.T., June 28, 1956, when bids will be opened. The cost of publication (advertising) must be paid by the successful bidder. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado, George H. Woodhall, Manager.

LEGAL

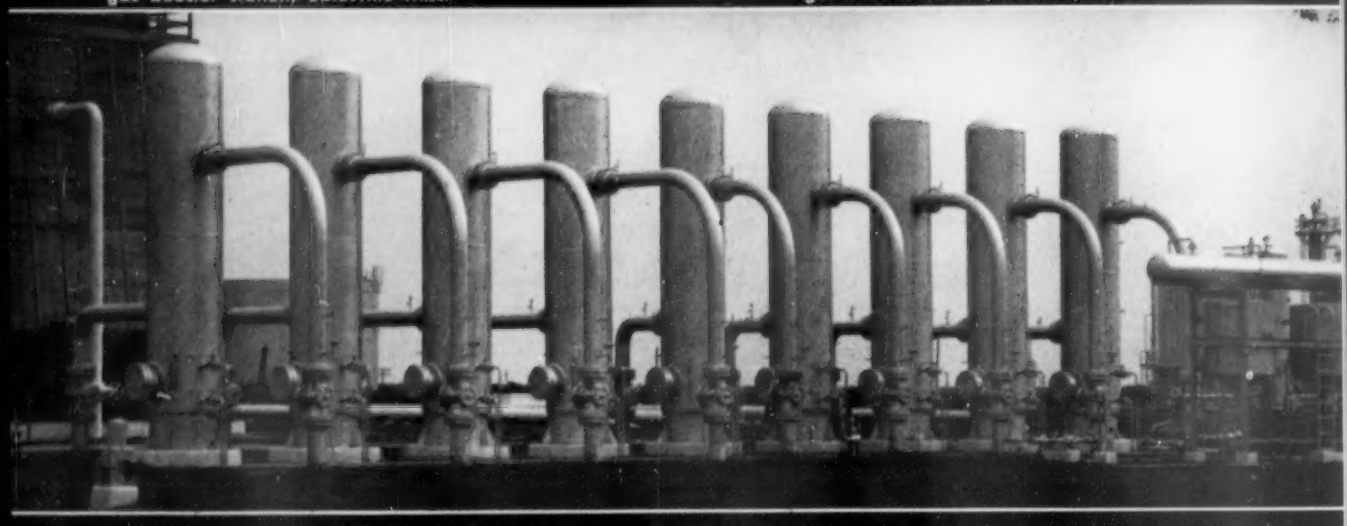
U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that approximately 2556.78 acres of land in twelve parcels within the known geologic structure of Rangely Field, Rio Blanco County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 P. M., M.S.T., June 29, 1956, when bids will be opened. The cost of advertising (publication) must be paid by the successful bidder. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. George H. Woodhall, Manager.



NATIONAL Gas Scrubbers, main line gas booster station, Batesville Miss.



NATIONAL Gas Scrubbers, main line gas booster station, Monroe, La.



NATIONAL Gas Scrubbers, main line gas booster station, Banquitte, Texas

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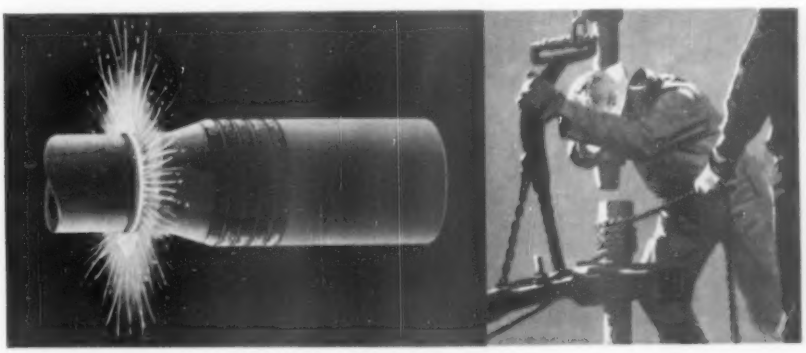

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